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AGRICULTURAL ECONOMICS AND SOCIOLOGY

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OF

AGRICULTURAL ECONOMICS AND SOCIOLOGY

AID FOR LOW-INCOME WORKERS IN AGRICULTURE

by Carl C. TAYLOR and Conrad TAEUBER

Bureau of Agricultural Economics
United States Department of Agriculture.

SUMMARY: Introduction. The discovery of destitution in rural life. Rural rehabilitation. Cooperatives. An experimental program. Tenure improvement. Agricultural laborers. Resettlement. Conclusions.

Introduction.

In the United States, aids to low-income workers in agriculture have developed rapidly in recent years. These aids are a logical outgrowth of efforts to establish and maintain an agricultural population of freeholders, and to provide on the land a means whereby low-income workers can gain a livelihood through agriculture. The Homestead Act was one step in this direction, and as early as 1877-78 the Congress considered bills which would have provided for the relocation within agriculture of the " insufficiently paid moral and industrious laborers and producers ". Since then, from time to time, similar bills have been before the Congress.

A further consideration of the background of the present movement would require a review of the history of the whole national development and a recognition of the tact that, after approximately 300 years of national history and approximately 150 years of consistent and energetic geographic expansion, agriculture in the United States has come to the end of an era. The rehabilitation and resettlement programs of the present day have arisen to wrestle with problems incident to changing situations that can be indicated by two fundamental facts: (1) that the frontier with its opportunities for geographic expansion has come to an end, and (2) that industrial expansion, with its capacity to absorb an ever-increasing number of employed workers, has slowed down, and to some extent and in some places has reversed itself. As this is being written the nation is going through a tremendous effort which involves the re-establishment of full employment, and there are predictions of labor shortages before this effort has been completed. However, if the present situation is temporary, then the country will again face the consequences of this continued development. For the immediate future there is no strong likelihood that all of the low-income workers who are not in agriculture will be absorbed into industrial production or into other nonagricultural pursuits. There is every like-

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lihood that there will be a need for continued dealing with the results of these developments.

In the course of national development in a number of areas, the natural resources—forest, minerals, or soil—have been largely exhausted, but the population left there was not sufficiently mobile to leave as opportunities disappeared. At the present time a number of new areas are being developed, through clearance of forest, or drainage, or both, in which families are starting with virtually no resources except their labor and their determination to carve out a place where they can gain a livelihood. Some of these efforts are misguided because the basic resources either will not reward them, or because the areas will not be able to repay the cost of bringing them into cultivation. In the development of two of the major agricultural exports—wheat and cotton—an organization has been built which has failed to provide an adequate living for the families involved or to provide them with the educational or other facilities which would lead to improvements.

The tradition of the agricultural laborer, who in the past was on a plane of social equality with the farm operator and who remained in the status of laborer only long enough to acquire the experience and capital necessary to begin operating a farm on his own responsibility, has persisted even in those areas where it is no longer a reality. This tradition has served to prevent action needed to protect the agricultural laborer who is part of a highly organized impersonal organization for the efficient conversion of basic raw materials into food or fiber. The systems of organization of factors in production have permitted—and in some cases fostered—exploitation of certain groups, and in some instances these have included farm owners and tenants as well as the hired agricultural laborers. In the concern with production for expanding population at home and expanding markets abroad, it was easy to overlook the development of a large segment of the agricultural population that was sharing to only slight extent in the incomes from this commercial production, and that lacked capital or skills to obtain a large share of it.

Agriculture as a whole in the United States has never recovered from the depression which followed the World War. During the 1920's numerous legislative proposals were made to provide relief through improvement of prices, markets, transportation facilities, and credit—all manifestations of the degree to which the farmer had become a part of the price and market economy and the extent to which agricultural leaders thought in those terms.

During the early 1920's, when farm prices and agricultural income were declining, industry and commerce in this country were relatively prosperous and a pronounced movement of population from farms to towns and cities took place. The magnitude of this movement, 4,000,000 net during the years 1922-1926, was great enough to alleviate what would otherwise have been considerable distress among the rural population. The technological advances which made it possible to produce agricultural products for an expanding total population without increasing the farm population were part of the same movement which created an expanding demand for workers in the nonagricultural sector of the economy.

In 1927 the urbanward movement was slowed down and it continued more slowly during 1928 and 1929. By 1932 the population was flowing back to the farm, and during most of the 1930's the net movement from farms was less than it had been during the 1920's. Although the migration of the 1920's reduced the farm population by nearly 1-½ million, in 1930 in many areas the pressure of population on resources was a serious problem. The opportunity to leave the farms was an important element in meeting the agricultural distress in the 1920's. The subsequent decline in rural-urban migration was equally important in increasing the distress.

The onset of the depression late in 1929 further intensified the distress of agriculture through the curtailment of buying power. It also meant a sharp curtailment of the opportunity to leave the farm for employment elsewhere, and in many areas it meant an attempt by those who were, or who feared to become, unemployed to find such security as they could in agriculture.

The discovery of destitution in rural life.

Among those persons who obtained their livelihood chiefly from the soil, there was a continued demand for assistance. This came in the form of efforts to raise and stabilize prices as in the Federal Farm Loan Board; improvements of credit relations as in the Farm Credit Administration; and numerous improvements in marketing and transportation. Subsequently, the Agricultural Adjustment Administration program was adopted. Although not designed specifically for low-income farmers, it was expected to help them through adjustment of supplies to demand and, thus, through the improvement of prices, as well as through some other long-term benefits, such as the conservation of land resources.

Other programs, and in a measure all of them, are available to low-income farmers. The credit programs, providing for loans for the acquisition of real estate, livestock, and equipment; short-term production loans; as well as loans against the harvested crop to assist the farmer in withholding it from the market pending the recovery of prices from the seasonal post-harvest slump, or pending a general increase in the level of prices, are examples. The widely dispersed projects of the Soil Conservation Service arrest damage to soil by erosion, prevent floods, and maintain and improve the basic resource of agriculture—the soil. These have been of assistance to many low-income farmers. The Forest Service maintains and improves the forest resources on public and private lands. These programs are in progress in many areas where low-income farmers are concentrated.

A number of other programs have been developed to assist all farmers and are thus available to low-income farmers who meet the standards of eligibility. In the case of the credit programs, it is assumed that the borrower is in possession of capital in some form which will serve as security, ample in type and amount, to satisfy the demands of the money market upon which the lending agencies are at least partly dependent. Emergency crop and feed loans tide over farmers who are the victims of some natural disaster, but these are only a small part of the total Federal loan program.

Despite continued efforts of the Farm Credit Administration, the Agricultural Adjustment Administration, and the agricultural conservation programs to make their benefits available to low-income farmers, they presuppose a size and type of operation which is out of reach of many low-income workers in agriculture. Moreover, they apply primarily only to those persons who are in the status of farm operators. Farm laborers have no share in the benefits derived from these programs, except as they may receive higher earnings through the farmers' improved ability to pay. Only in connection with the " sugar program " has there been a definite effort to obtain direct assistance to farm laborers. Through the setting of minimum wages to be paid by those farm operators who expect to participate in this program, some aid is given to farm laborers.

Many changes have been made in the programs administered by the Agricultural Adjustment Administration to provide more direct assistance for low-income farmers than was originally done. Certain conservation practices are especially designed to help farm families supply a larger portion of food from their own farms. The planting of orchard trees and improved pasture and grazing practices to encourage farmers to produce enough dairy products to fill out deficiencies in their diets are promoted, and in some areas a special AAA payment has been made available for the cultivation of garden plots. Furthermore, under the agricultural conservation program, any farmer is able to earn at least $20 by complying with special acreage allotments and by carrying out certain soil-building practices. A farmer who would ordinarily earn less than $20 by planting within his allotments has been enabled to carry out soil-building practices so that he can earn a total payment of at least $20.

To say that the aids to all farm operators have not gone to the heart of the problem of low-income workers in agriculture is to say that programs not specifically designed for this group are likely to be of only limited assistance in the solution of their problems. In 1930, one-half of the farm operators in the United States had only a very small stake in total production of crops which reached the market. For the other half of the farm operators, as well as for a large proportion of farmers whose operating capital has been depleted through drought, flood, and depression, and for large numbers who have become dependent upon agricultural wages, most of which is for seasonal labor, adjustments of prices, of marketing, of credit arrangements, crop insurance, or similar programs are of only limited value. If the problems of these groups are to be attacked realistically and constructively, programs must be designed to deal with basic problems and equipped to take the necessary steps.

When the Federal Emergency Relief Administration was established, it was quickly discovered that about one million farm families were destitute. By no means were all of these farm families newly poor, and not all poor farm families were then, or have been at any time since, on these rolls. Farm people in the United States have never readily admitted their poverty and have always been slow to accept anything that savored of charity. Consequently, they have never developed social machinery to discover their poverty or to care for it.

The almshouse, a little out-door relief, and in rare instances Red Cross assistance in times of catastrophe have constituted their only means of relief. They have usually absorbed their distress in their own families, communities, and local church circles, and have been too proud to let others know of it.

During the depression, at least three and one-half million, or more than one out of every four, rural families had received public assistance at some time. Many low-income workers in agriculture shared in these benefits—approximately 2,000,000 farm families have received relief. In the very nature of relief programs, which were thought of as temporary expedients, the Federal Government faced the problem of administering such programs on a Nation-wide scale, with little experience to indicate the varied aspects of the problem. There was an immediate job to be done in providing assistance to persons in need. As this work developed, it became increasingly clear that some differentiation in approach was called for and especially that the type of assistance needed was not the same for all persons and families. Specifically, it became apparent that a program for dealing with farm families needing public assistance should differ from a program designed to assist urban victims of unemployment.

Out of that recognition arose the program of rural rehabilitation which, after a number of administrative changes, is now one of the major activities of the Farm Security Administration, the chief agency of the Department of Agriculture and the Federal Government for direct assistance to low-income workers in agriculture. This agency administers a number of distinct programs for the assistance of low-income workers in agriculture. The rural rehabilitation program provides assistance through supervised credit; the resettlement program assists in relocation of families on better lands; the tenant-purchase program assists tenants in achieving ownership; and provision is made for direct subsidies or grants. Provisions for debt adjustment and for the organization of cooperatives for buying and selling are made, as well as provisions for health and community service. The farm labor camps provide shelter and other services to migratory farm laborers.

Rural rehabilitation.

The rural rehabilitation program is designed to render assistance to farm families when they are, except in those instances in which a family is living on the land, of such a character that no workable farm and home plan can be developed. Under this program loans are made to destitute and low-income farm families for the purchase of farm supplies, for equipment and livestock needed to get a new start on a sounder basis, for the refinancing of indebtedness, and for family subsistence. Rehabilitation loans are limited to families on or near relief who are unable to get adequate credit from any other source, private or public. When an applicant comes to the local office of this agency, the first step is to make an inventory of his assets and liabilities, and to develop a plan of operation which includes, not only the production of those farm products most suitable for the particular situation, but also the expenditures needed for family living—food, clothing, housing, education, recreation, medical

care, etc. It is recognized that the operation of a farm is essentially a family enterprise and the contributions of husband and wife, and of the children of working age, toward rehabilitation are all taken into account in working out the plans for the family. The analysis of the needs of the family and its resources, along with its capabilities and skills, makes apparent the additions to operating and household equipment that are necessary to start the family on the road toward the goal of eventual self-support.

The next step is a loan to permit the acquisition of the needed equipment and supplies. The length of time allowed for repayment varies with the purpose of the loan, and the interest rates are kept at a low figure. As one of the chief needs of a majority of these families is for greater production for home consumption, the initial loan is likely to include equipment for preservation of food and especially a pressure cooker, which makes home canning possible even for those farm women who have had little or no experience in such activity. Subsistence livestock is emphasized, as is the necessary livestock and equipment to make the farm more productive. The family receives the assistance and guidance of a skilled farm manager and a trained home economist. It is due to the availability of this type of guidance that the Farm Security Administration has been able to make loans to families that ordinarily would not be considered good credit risks, and has shown that these people can and will repay such loans.

Loans are only a part of the program. The intensive educational program through group meetings and individual visits to the farmstead are important elements in changing attitudes, developing morale, and in making the educational efforts effective. A large share of the families affected by this program had previously had little contact with the widespread adult educational activities of the Agricultural Extension Service; in fact, they had very little contact with educational or other agencies within the communities in which they lived. "Supervision" or individual family guidance is, therefore, of major importance in the program.

The production of a maximum of vegetables and fruits for home consumption illustrates the development of new habits and attitudes which is a part of the program. A large proportion of these families have never had adequate gardens. The chief reasons are lack of available land, ignorance of suitable varieties and methods of cultivation or preservation, lack of funds to buy seeds or the equipment for preservation, lack of training in the necessary skills, and a false appraisal of the economic returns from efforts devoted to such production, with some superstitions toward such staples as carrots or tomatoes. All of these and other factors had combined to make the cultivation of a garden or the growing of meat or dairy products for home consumption either nonexistent or a very indifferent activity on the part of a large proportion of the families. During the depression years these types of production may even have declined; the need for cash may have been responsible for the sale of a cow or other animal which might have been kept to produce a part of the family food supply if other pressures had not been so severe. The rehabilitation

problem therefore is largely an educational one, overcoming traditions which leave the tending of a garden to the farm woman, developing new dietary habits, developing a sense of achievement in the well-stocked food-storage house and learning the necessary skills. The needed seeds and equipment can be acquired through loans. In many parts of the country where gardens are not common, an observant visitor would be able to identify borrowers simply by the presence of a well-fenced and tended garden. It is one of the first tangible bits of evidence that the family has started on the road to rehabilitation. The last report for the borrowers at the end of the year 1940 estimates that the value of products produced for home consumption increased from $163 per year during the last year before the family came into the program to $264 during 1940. The increase of $101 is equal to approximately three-fifths of the total increase in net income which is reported for these families.

Nutrition and health are frequently badly neglected among these families. Emphasis on home production of all possible foods is one step in improving both, for with very few exceptions the customary diets do not conform to the standards which are generally recognized as necessary for the maintenance of health and physical efficiency. Along with this emphasis the program involves intensive education in diets, and the results have amply justified this effort. Improvements in environmental sanitation have been promoted through provision of safe drinking water, sanitary disposal of excreta, screening against insects, and control of disease-carrying insects. Medical care for a large proportion of these families has been inadequate, both because of the inadequacy of medical facilities and because the families have been unable to pay for such care. Medical examinations of borrowers in a number of areas have shown a large number of physical defects and diseases, and it is presumed that a great many of the problems of these families are related to these physical deficiencies.

In order to meet the current needs for medical care, an extensive program for such care has been inaugurated in 33 States. By agreement with the local physicians, funds are set up to meet the cost of ordinary medical care. By pooling the funds from each family and working out arrangements which assure the physician of payment for service rendered, it has been possible to obtain much improved medical service for low-income farm families. When the family's farm and home plan will not support a loan for participation, then the necessary amount, usually not more than $35 per year for a family, may be given as a direct subsidy. Through this work, 106,500 borrower families have been enabled to obtain essential medical care and 29,000 member-families dental care.

Supervision of credit as well as of production is one of the major techniques used in the process of rehabilitation. It implies a credit structure for the individual family which is adapted to its resources and needs. While some of these families have been considered such poor credit risks that they have virtually no outstanding indebtedness, for the majority of the borrowers the burden of debt has been a major element in the need for assistance. Therefore, a farm-debt adjustment service has been developed, providing for a readjustment of

the indebtedness of the family to bring it within the ability of the family to pay. More than 100,000 families had availed themselves of this service by the end of 1939. The adjustment is entirely on a voluntary basis—the chief inducement to the creditor being the ability to collect at least a part of what would otherwise be an uncollectible loan. This service also assumes that the assistance will benefit the family directly; otherwise, in many of these cases, the only beneficiary would be the creditor. Under the arrangement worked out, the family is enabled to repay its indebtedness and more fully to use its credit resources as an instrument in achieving self support.

The rehabilitation program, which is developed in nearly all of the more than 3,000 counties in the United States, is available to any farm family that is in need, is unable to secure credit through the usual channels, has access to a farm of economic size, and that in the opinion of a committee of local farmers has the ability, energy, and morale to be successfully rehabilitated. By May 31, 1941, there were 479,028 active standard rural rehabilitation borrowers, i. e., families participating in this program. Since the beginning of the program 897,788 families had taken part in it and had been loaned a total of about $563,204,946, of which $357,067,750 was outstanding on May 31, 1941.

Although this program of rural rehabilitation has reached so large a number of farm families in need of assistance, obviously it has not yet reached all such families. A constant endeavor is made to find techniques for meeting the needs of other farm families who need assistance. One of these is the granting of a direct subsidy. This may be done to meet special needs, as medical care, subsistence for humans or livestock, and other emergency purposes, when doing so would contribute to the ultimate rehabilitation of the farm families. These grants have been used primarily in those areas where severe and protracted droughts have created extraordinary needs for emergency assistance. By May 31, 1941, 6,503,888 families had received this form of assistance and a total of $129,725,573 had ben paid out. Wherever it is at all possible, the grant is made in accordance with the terms of a work agreement providing for work on public land or on the individual's farm. Under such an agreement, which covers his own farm, the farmer agrees to carry on certain types of work which will result in ultimately creating more resources for his use, such as drainage, land clearing, terracing, erection of buildings, etc. Thus, during the period that such assistance is needed, he is enabled to remain on the farm, and to devote his efforts to the improvement of his resources, thus more rapidly achieving the goal of self-support. Otherwise, the need for additional funds might require the farm operator to delay making needed improvements on his farm and might delay indefinitely the time when he would be able to support himself through the resources at hand.

During the fiscal year 1939-40, about $92,800,000 was loaned to rural rehabilitation "standard borrower" families, and $536,000 to other rehabilitation borrowers. About 69 percent of the "standard" families (those with definite farm and home places) had net incomes of under $500 during the year before

acceptance as borrowers. Apparently all of these families had a gross income of under \$700. Of the \$92,800,000 loaned, approximately \$55,000,000, or about 58 per cent., was loaned to families with an income of less than \$500 net during "the year before acceptance".

The Farm Security Administration during the fiscal year 1939-40 made grants of \$19,000,000, mostly in the Great Plains region and in flood and drought areas of the southeastern States. In the absence of data as to the normal productivity of the farms on which recipients of these grants lived, it may be assured that all produced less than \$700 worth of products.

Cooperatives.

The use of the small local cooperative to provide improved breeding stock, large machinery which an individual cannot own economically, and other facilities, as well as buying and selling, has been an important part of the whole procedure. By cooperative purchase of high-grade sires, the quality of the livestock is raised; by cooperative ownership of such machines as tractors, feed grinders, corn shellers, sawmills, and even of mowers, hay rakes, and other farm equipment, farmers are enabled to take advantage of the efficiency of these machines without incurring the high overhead costs of individual ownership which would be prohibitive for them. The cooperative ownership of small tools and machines which are infrequently used has meant the possibility of doing work and making repairs which would otherwise not have been done, and the cooperative ownership of washing machines and other household equipment has lightened the burden of work for some housewives. Approximately 20,000 of these community and cooperative services with a total participation of about 400,000 families have been organized, and financed by Farm Security Administration loans.

Nothing illustrates better than this development of cooperative services the aim of making available to these families the benefits which scientific or technological advance have made possible. Nowhere is there any thought of reserving these for the more prosperous farm families. It is rather an approach of balancing all of the costs against all of the benefits and finding ways of making them available when benefits outweigh costs.

An experimental program.

But even with this varied approach a large number of low-income farm families who cannot take advantage of these facilities remain.

To meet the varied needs of low-income farm families who are not now being served by the regular program, a number of adaptations and experimental programs have been developed. These programs are an attempt to reach other families who may not have access to sufficient land to develop an economic farm unit, or who may have had so few resources that they would not be recognized as acceptable credit risks under the program as generally applied. They may

require more intensive supervision than the average family in the program, may have more serious physical handicaps, or perhaps for other reasons have not appeared acceptable for the standard program.

In connection with one of these programs a survey was conducted in 11 counties, distributed in the problem areas of the rural United States. The most common and fundamental problems found in these areas were classified as follows:

(1) Economic difficulties:
- (*a*) Inadequate production of food for home consumption.
- (*b*) Poor farm-management practices.
- (*c*) Insufficient crop acreage.
- (*d*) Lack of tenure security.
- (*e*) Lack of livestock housing and disease-preventing services.
- (*f*) Lack of marketing techniques and facilities.
- (*g*) Lack of nonfarm employment opportunities.

(2) Environmental difficulties:
- (*a*) Lack of adequate housing and housing accomodations.
- (*b*) Lack of proper sanitation facilities.

(3) Physical difficulties:
- (*a*) Prevalence of acute or chronic diseases and physical defects.
- (*b*) Lack of medical facilities.

(4) Social difficulties: Lack of satisfactory social and educational services.

(5) Emotional difficulties: A deep-seated feeling of inferiority and distrust in humanity.

Not all of the families who were in need of the type of assistance which the Farm Security Administration was prepared to give were willing to accept such assistance. The major reasons given for unwillingness to come into the program were fear of going farther into debt, a preference for the slender security offered by the programs of public work for persons in need, and in some cases an unwillingness to live on the small amount of money which would be available for subsistence during the first years in which a program was developed. But more than 500 families were willing to attempt the experiment. A brief summary of the progress reported will illustrate not only the devices used in attacking these problems, but also the very low economic conditions to which some families in rural areas had fallen. While some of these families were clearly depression victims in the sense that they had lost an earlier higher status as a result of the depression, for the majority the depression was not the major element in bringing them to their present situation. It contributed by making it more difficult to find a way out of the situation, but the basic conditions which were involved were there even before the depression of the 1930's began.

During the first year the average loan was $488 per family, but this ranged from an average of $138 per family in a country in the Southern Appalachians to $1,143 in an area in northern New England. For these families it was not possible to work out farm and home plans in which income would balance expenditure the first year, and an average grant of $201 was made in order to assist the

family in more rapidly becoming self-supporting. The loans were made and utilized to provide capital goods or farm improvements such as livestock, new machinery, new buildings, soil-building materials and land improvements, group services, major household equipment and furniture, major house improvements and repairs, and for the purpose of adjusting or repaying old debts. The grants were used primarily for food, while the program for home production was being developed, but some assistance of this type was also required for farm operation, household operation, and equipment, medical care, environmental sanitation, and smaller items for clothing, personal expenses, and to permit participation in certain community enterprises.

The most rapid improvement has been made in food production; in one county in which most of the effort had been devoted to one cash crop, there was an increase of 642 percent in the value of foods produced. In several of the counties the value of food produced has more than doubled. In one of the southern counties only one-fourth of the families had cows before coming into the program; by the end of the first year each family had acquired a cow and more than three-fourths each had a heifer to be kept as the second cow. In many instances families who had never before had milk to drink have *learned to use milk*, and more than one home-maker has come to the home supervisor to learn how to use the surplus milk, a situation that the supervisor had never before faced. From 2 to 10 new vegetables and fruits have been introduced into each of the counties since the beginning of the program, and the balance between fruits, vegetables, and meat has improved. The average number of quarts of food canned per family in one county increased from 43 to 258 in one year. This increase is all the more significant in view of the fact that the smaller figure represents pickles, jellies, sauerkraut, and preserves, whereas the latter figure represents a balanced variety of vegetables to assure balanced meals through much of the winter. The quantity and variety of stores of foodstuffs have also increased, and in some of the areas a large-scale construction of food cellars and other food-storage facilities took place. Many of these were built from native materials, and in some instances the construction demonstrated the possession of unsuspected skills among the borrowers.

More efficient utilization of the soil resources which are available was an urgent need in most of these areas. In one of them, located in the Southern Appalachians, the more fertile bottom lands had been rendered useless by a rising water table and lack of drainage, and as a result cultivation of the steeper hillsides was being carried on as erosion successively rendered the less steep slopes unfit for use. This particular area had also experienced an increase in population, partly as a result of high birth rates, parlty because it served as a refuge to some unemployed persons who formerly lived there. Through cooperative effort of the families in the valley, a drainage program was initiated, depending primarily on the willingness of all of the families to cooperate. For several months the supervisor served primarily as a drainage adviser, providing technical assistance in determining location and grade of ditches and the use of local materials in place of more expensive tile. Only after this work was done were funds advanced for the basic treatment of the land to restore it to agricult-

ural use. Furthermore, each family cooperating was pledged to restore the steeper hillsides to forestry as the bottom lands became available for use.

In an area in the Southwest, parcellization of the land had reached extremes. Some strips were not more than 20 yards wide and varied from one to five acres in area. Here two techniques were used to secure additional land. On the one hand a cooperative grazing enterprise was launched and it was possible to acquire the needed grazing land near the village. On the other, a cooperative public works program was undertaken to reclaim additional land and subject it to irrigation from the nearby river. The provision of direct subsidies to provide for the necessities of life while this effort was being carried on paved the way for the acquisition of this resource which will contribute in large measure to the well being of the inhabitants. In several of the areas assistance has been rendered to clear additional land.

Improvements in tenure arrangements were effected by arranging for written leases for periods of five years in some instances; in others it was possible to so modify land purchase contracts that they provided greater security for the purchaser. In some cases arrangements were made to have the landlord accept improvements in lieu of a rent payment. New techniques of land management and marketing have been developed among these families, although in some instances considerable educational effort was necessary to persuade the borrower that the newer method was superior to the one which had been handed down to him through family tradition.

Not many of the families had housing as poor as that of the young couple living in a log cabin which the man had himself constructed and which was provided with a window by virtue of the fact that he had found the windshield of an abandoned car and adapted it to this use. But many have made improvements in their houses, largely through their own efforts and through the use of native materials. At very little cost it has been possible to make the houses more nearly weathertight and to provide for the effective utilization of skills and materials. Environmental sanitation has been improved through development of sanitary water supply, the development or improvement of disposal of waste, and the provision of screens.

One of the important elements in the rehabilitation of these families has been an awakening of interest in group and community activities. In some instances special activities were developed among them; in others the demonstration that they possessed unsuspected skills or had made an achievement which gave them status in the eyes of the community has meant a willingness to participate in activities from which they had formerly shied away. A large proportion of these families have lived in virtual social isolation and for them a part of the rehabilitation consists of exposing them to the stimulation which comes through their taking part in group activities. The development of improved morale, the ability to participate on an equal footing in the activities of the community, the stimulation of success in one activity which gains recognition in the community—all of these are among the most significant aspects of the process of rehabilitation. The fact that at the beginning of the program the net worth, i. e., the difference between assets and liabilities, ranged from

an average of $72 in one locality to $1,264 in another indicates that there is room for a great deal more progress. But when the progress made is measured in the stimulation to further effort and the conquest of the lethargy which had previously impeded any effort at betterment, it is clear that some of the more vital initial steps have been taken. The economic improvement which has been recorded is partly the result of the provision of more resources in the form of land and livestock, better management of the resources available, improvements in marketing and tenure relationships, and a fuller utilization of the energies of the farm family, through greater diversification of production and the provision of incentives by the demonstration that efforts at improvement do yield results.

Other experiments have been operated in other ways to meet the wide variety of local situations. In one area in the South, 100 families, Negro and white, who had been living on land devoted primarily to cotton, were taken on as borrowers when the Farm Security Administration bought the land on which they had been living. The effort there was to demonstrate that by a reorganization of the pattern of farming the land which had been supporting its residents far below any standard of adequacy could be made to yield a living consistent with its high productivity. The dependence upon one cash crop was abandoned in favor of a diversified agriculture, but the cash crop was continued as a major source of income. However, attention was given to improved techniques of cultivation, improved varieties, and methods of marketing which would yield a greater return than had formerly been received when a larger acreage was devoted to it. The major processing plant for preparing the cash crop for the market was taken over by a cooperative organized by the borrowers. A large amount of cooperative purchasing was done through a store which the borrowers took over. Through cooperative ownership of much of the farm machinery used there, and the provision of credit to secure those items of machinery and the livestock needed by the individual families, a sound basis for the altered agricultural economy was assured. Although the houses and other buildings were modest according to most standards, they were far above the level prevailing in the area. An intensive educational effort was carried on with farm operators, their wives and children in the new techniques required and the demands of the new way of life which was being developed there. One measure of success is the growing list of applicants who wish to be accepted as participants in this experiment and the growing local sentiment for its expansion beyond the families originally included. The purpose of such efforts is not only to assist the immediate beneficiaries, but also to provide a pattern which may be applicable to other areas and groups confronted with similar conditions.

A great deal of space might be devoted to description of similar efforts designed to meet the problems of low-income farm families in the large variety of situations that are found in all parts of the country. Basically they seek to provide more adequate resources; more efficient utilization of these resources, especially through the development of the maximum of production for home consumption and the more effective disposal of those products which go into

commercial channels; the development of skills for the maximum utilization of the available labor; and the development of those drives which come from the possibility of achieving a goal hitherto not visualized or considered as impossible of achievement.

Tenure improvement.

To meet the problems of an increasing proportion of tenants in the major crop-producing areas, the Congress in 1937 passed the Bankhead-Jones Farm Tenant Act. As a result there has been set in operation a program to assist competent farm tenants, sharecroppers, and farm laborers to become farm owners. Applicants under this program must be citizens of the United States and preference must be given to persons who are married or who have dependent families, who are able to make an initial down payment, or who own livestock and farm implements necessary to carry on farm operations in their locality. In each county in which the program is established, a committee of three farmers examines applications for loans, appraises the farms to be purchased, and recommends those applicants who possess the character, ability, and experience to make successful farm owners. Loans are made for periods up to 40 years at an interest rate of 3 per cent. By June 30, 1941, 20,720 farmers in 1,632 counties had been accepted for this program. By that time a total of $117,041,378 had been approved for such loans. During the 12 months ending June 30, 1941, a total of $47,984,726 had been loaned. It is estimated that one-half of these borrowers had produced less than $750 worth of products during the year before they were accepted for this program.

Farmers who are accepted for this program are also eligible for loans under the rural rehabilitation program and receive the same technical and advisory services which are available to other borrowers.

When it is remembered that there were 2,361,271 tenant farmers in the United States on April 1, 1940, it is apparent that this program, even with the expansion that now seems possible, can assist only a fraction of tenants in becoming owners. A larger proportion of tenants than of owners are in the low-income groups, and an improvement in their relations to the land, as well as their relations to the landowners, can be presumed to result also in improvements of their economic conditions. Therefore, research, planning, and educational work has been devoted to improvement of tenure relations, providing for written leases, involving express agreements relating to the term of tenure, division of returns, compensation for permanent improvements to the property, and other arrangements which will reduce the disadvantages to tenant families as well as to the properties they operate.

Agricultural laborers.

With the exception of the provision of minimum wages for sugar beet workers mentioned above, these aids to low-income workers in agriculture apply only to farm operators or to persons who have some immediate prospect of becoming

farm operators. Agricultural laborers as a group have had comparatively little attention from governmental agencies, and no large-scale efforts have been made to provide specifically for their welfare. Public relief programs in recent years have provided some employment for them during the off-season, as they have for other seasonal workers, and agricultural laborers have been eligible for other public assistance programs on the same basis as other persons in need of public assistance. The workmen's compensation laws which generally provide for compensation to workers in industry do not apply to agricultural workers. Old age insurance and unemployment compensation do not include agricultural laborers, while they are engaged as such. As those social insurance provisions to which the worker contributes apply only to workers in the "covered" industries while they are so employed, and as some seasonal agricultural workers spend a part of their working time in these industries, some of the agricultural workers are thereby included in the social insurance funds. But their employment in agriculture is not counted as employment for purposes of the social insurance programs, and under such conditions the benefits they can accumulate are not sufficient to fulfill the objectives of the social insurance program.

Migratory agricultural workers have been the object of some special programs in recent years. In areas where they are numerous the Farm Security Administration has provided temporary sanitary housing facilities, through the establishment of 37 permanent and 16 mobile camps. Most of these are found in California, with a few in Texas and Florida. The construction of other camps is under consideration. The permanent camps are located in areas which require a large volume of seasonal labor for relatively long periods. Here workers secure shelter in temporary cabins, at nominal rentals, that may be partially or wholly worked out by doing maintenance work at the camp. These camps provide shelter, sanitary facilities, laundry facilities, and a variety of community educational and recreational facilities. One important part of their work is the maintenance of health clinics, which make medical services available to this group of workers who otherwise would have little opportunity for securing them. To be eligible for these camps, persons must be bona fide agricultural workers and in need of such assistance.

The mobile camps are designed to serve the same purposes in those areas where conditions do not warrant permanent camps. They provide, insofar as possible, the same type of services provided by the permanent camps.

Partly as an outgrowth of the camp program, a number of projects have been developed which provide for "labor allotments", small holdings where migratory agricultural laborers may carry on subsistence agriculture, and which they use as a permanent base of operations. These holdings provide a means for producing much of the food which the family requires and a stable residence at nominal cost, thus permitting the familly to become a part of the community and to take part in community activities. A large proportion of the workers who are now engaged in migratory agricultural work have a background of residential stability, and have begun their present occupations only as a result of the loss of their former security as farm operators. All the information now

available indicates that they seek to re-establish stable residence as quickly as possible.

Closely related are other attempts to provide housing facilities for seasonal workers in crop areas where the workers are likely to find all of their employment within a short radius. In one such program housing has been provided, along with subsistence-garden facilities. In another effort housing is provided by erecting a house on private land and providing for ultimate acquisition by the farm operator in return for certain specified services, such as rental of land for the house and for subsistence agriculture, pasturage for cows, or other subsistence livestock, etc. Another similar effort arranged for the cooperation of landowners in the promotion of an educational program for the production and storage of food for subsistence purposes. Carried on in an area where the demands of the cash crop have been such as to discourage, if not to prevent, the production of food for home consumption, this program was designed to increase the real income of these families by reducing the cash outlay required for items they might provide for themselves. Landowners provided the necessary land, rent free; the F. S. A. provided garden seeds and tools, as well as the technical guidance to assure production, and pressure cookers and containers to assure proper storage for the winter. In those cases in which land for pasturage could be secured, loans for the purchase of cows were arranged.

Efforts of this kind to improve the condition of agricultural laborers within the framework of their present employment relationships have been increasing in number, though as yet they reach only a very small proportion of those persons who obtain their livelihood primarily from this type of activity.

Resettlement.

As part of the effort to assist low-income workers in agriculture, there have been established a number of projects providing for the relocation of distressed farm families on the land. These have developed a variety of forms of organization, from individual ownership and operation in dispersed settlement, to compact settlement operated through cooperatives which own the property, arrange for payment of wages to the cooperators, and ultimately distribute the remainder of proceeds to the cooperative families. Some of these projects were developed in conjunction with public purchase of land which should be withdrawn from agriculture to provide superior opportunities for the families formerly living on such land. They have been established to provide a livelihood for families who could not be absorbed in the agriculture of their locality because of changes which reduced the number of farms or because of inability to absorb the natural population growth. And in some cases they have been developed to provide a more rational utilization of agricultural resources for the benefit of present residents of the area, through a reorganization of the agricultural practices. Some of these experiments, and most of them are still in the experimental stage, have developed a number of patterns and approaches which may be of far-reaching importance to agriculture in the future.

Like the rehabilitation program, which takes the families where they are located, the resettlement program uses supervised loans, technical guidance, and stimulation of production for home consumption as its major tools. Whether the individual is ultimately to own his part of the project outright, whether he is to own it through his interest in the cooperative which actually holds title, or whether he is to continue as tenant on publicly owned land, the objective is to provide a means of improving his level of living through the more productive use of his own labor and the resources which are available to him. A few of the projects have been established in such a way as to provide for the possibility of combining industrial employment with agriculture.

While the work of the Federal Government is predominant in programs of this type at the present time, a number of projects have been established by philanthropic institutions and some are primarily the work of public spirited entrepreneurs who saw in the establishment of a sound agricultural development the best basis for development of the lands which they owned.

Conclusions.

The equitable distribution of economic and social dividends in any social order requires some policy toward the distribution of the population among the various branches of occupational activity. The present programs for aid to low-income workers in agriculture need further to define their objectives in this respect. For the immediate future they are operating on the assumption that hundreds of thousands of farm families in the United States, especially sharecroppers and farm laborers, have been caught and to a considerable extent defeated in the intricate meshes of an elaborate commercialized farm economy, and that they will find their most practical attack on the problem of improving their condition through agricultural techniques. The experience of recent months has re-emphasized the importance of vocational education and placement activities and guidance for migration from rural areas as one means of assisting low-income workers in agriculture. The location of industrial plants in rural areas has provided at least a temporary outlet for surplus workers in agriculture, and in a few areas it has provided the basis for the development of a combination of agriculture and industry. Transfers into other occupational activities will continue to play a part, but these transfers can be considered as a wholesale remedy only when they can provide greater assurance of continued maintenance of a higher level of living than the industrial system of the country has hitherto been able to do.

INTERNATIONAL CHRONICLE OF AGRICULTURE

SWITZERLAND

SUMMARY: 1. Conditions and trends of Swiss agriculture on the eve of the present world war. — 2. Conditions and trends of agriculture since the outbreak of hostilities (*the rationing or direct or indirect fixing of quotas for the distribution of certain foodstuffs, compulsory delivery, price control, increase or re-orientation of production, prices and social income*). — 3. Land system and the campaign against the inflation in land prices. — 4. Land improvement. — 5. Activities of public and private organizations. — 6. Agricultural co-operation; agricultural credit; social insurance; rural social policy; agricultural labour.

1. Conditions and trends of Swiss agriculture on the eve of the present world war.

The new war, which followed so closely upon the war of 1914-18, has afforded a clearer understanding of the importance of agriculture in assuring the country's food supplies.

It should be recalled that between 1906 and 1913 the *net return on total farm assets* (1) in Switzerland was small: 3.6 per cent. in round figures. During the war, from 1914 to 1918, and especially towards its close, the shortage of foodstuffs and the difficulty of importing them caused a considerable rise in prices: during the period 1914-19 the net return rose indeed to 8.5 per cent. In 1922, as a result of the serious fall in prices following monetary depreciation abroad and mass importation from overseas, the prices of agricultural products in Switzerland also collapsed, and the net return, which had fallen sharply even in 1921, declined to 1.1 per cent. Readjustment set in progressively, but nevertheless the net return had scarcely touched 3 per cent. when the second world crisis occurred in 1931. Figures for the net return fell to 1.5 per cent. in 1931, and to zero in 1932. It was not till 1936 that the figure again reached or exceeded 3 per cent.

From the above figures it will be seen that when the new conflict broke out, agriculture had not yet had time to build up reserves in case of a possible new crisis. On the contrary, indeed, while farm debts were estimated at 3,800 million francs in 1911, as against capital assets amounting to 5,100 million francs, it is estimated that by 1939 they had increased by 1,500 million although the capital assets had only increased by 600 million francs.

The situation would have been even worse, had the authorities and the Swiss people, profiting by their experience in the war of 1914-18, not realized that it was necessary to ensure a certain amount of protection to agriculture. Considerable sums, especially after 1932, were expended in order to maintain the price of milk at a level which would at least be sufficient to enable dairy farms to go on. After the

(1) Interest return expressed as a percentage of total capital invested in agriculture, or total capital invested.

last war, moreover, in connection with breadmaking cereals a policy has been pursued aimed at enabling the farmers to grow them: milling bonuses, purchase of surpluses by the Confederation at fixed prices. Unfortunately these laws afforded no protection to fodder cereals. Although the areas sown to breadmaking cereals increased from 90,500 to 109,000 hectares between 1926 and 1938, this improvement was obtained for the most part at the expense of fodder cereals, the area sown to which fell from 28,300 to 17,300 hectares.

In any case, at the outbreak of the new world war, Switzerland, a country with a heavy rainfall, and thus best suited by nature to fodder production and cattle rearing, was practically self-sufficient as regards milk, dairy produce and meat; she even exported large quantities of choice cheese and some other dairy products; on the other hand, she depended on foreign markets for edible fats, for about three-quarters of her cereals and for as much as nine-tenths of her sugar requirement.

This situation, which was bearable in a world enjoying perpetual economic and political peace, could not but cause anxiety to far-sighted people. Would it not be possible, by adopting a suitable economic policy, to reduce to a certain extent the number of head of cattle and the production of the dairy industry, while increasing, on the other hand, the area sown to crops ? In this way Switzerland might be enabled to solve the pressing problems which arose in connection with her exports at greatly reduced prices of a large surplus of dairy produce to a world market surrounded by protectionist barriers. Furthermore, since grain crops, supply a much larger amount of calories per unit of area than do grass crops transformed into animal foodstuffs, the food supply of the population would be much better assured in the event, which was becoming increasingly probable of a new world war.

This was the two-fold reasoning which inspired the Message presented to the Chambers of the Federal Council on December 12, 1938. The Chambers approved the Executive by passing, on April 6, 1939, their " Federal act for the *extension of arable cultivation* " (1). The main provision of this decree contemplated the establishment of a bonus for fodder cereals (art. 3). The decree also authorised the Federal Council to "issue provision of a general character concerning the control of cultivation and to "establish the measure in which each farm should take part in the re-orientation of production " (art. 7).

2. Conditions and trends of agriculture since the outbreak of hostilities.

The Federal Decree dated April 6, 1939 had scarcely begun to be put into execution when war broke out at the beginning of September, 1939. When this occurred, Switzerland and Swiss agriculture were in a state of economic preparation considerably better than that existing in 1914. Agriculture, which was better organized, was able, this time, to overcome the initial period of confusion without panic and without a collapse of prices. Indeed, on April 1, 1938, the Chambers adopted a " Law to provide for insuring the country's supply with indispensable commodities " (2) giving extensive powers to the Federal Council which was empowered chiefly: to constitute stocks on behalf of the Confederation or to compel public or private establishments to constitute such stocks (art. 3); to order an increase in the production of agriculture and for-

(1) *Recueil officiel des lois et ordonnances de la Confédération suisse*, 1939, p. 426.
(2) *Recueil officiel*, 1938, p. 309.

estry (art. 4); in case of the threat of imminent war to take also other measures necessary to guarantee the food supply of the population and of the army (art. 7). In case of war provision had been made for the immediate institution of a series of War Economy Bureaus attached to the Federal Department for Public Economy. Actually, these Bureaus commenced to operate immediately after the outbreak of hostilities. Among those particularly connected with agriculture, mention should be made of the so-called Supply Sections for: (1) cereals; (2) milk and dairy produce; (3) meat; (4) potatoes, fruits and alcohols; (5) edible oils and oil seeds; (6) poultry and eggs, as well as (7) the Section for agricultural production and domestic economy; (8) the Sections for fertilizers and garbage; (9) the labour Section; (10) the timber Sections and (11) the Section for the production of heat and power. Some of these sections are new institutions, while others represent enlargements of administrative organisations already existing in the Confederation.

Apart from ensuring production and supply, it was also necessary to prevent occasional shortages in certain foodstuffs from creating panics and an excessive rise in prices. Three series of measures were therefore adopted for this purpose:

(1) *The rationing or, possibly, direct or indirect fixing of quotas for the distribution of certain foodstuffs.* — Applied originally essentially to easily preserved household products such as rice, alimentary pastes and sugar, rationing was later extended to butter and then, more recently, to cheese. In the case of milk, salesmen were compelled to adjust their sales on a rational scale. It was disposed that the slaughter of pigs should be limited each month to a given percentage of the slaughters effected in the corresponding months of the previous years (40 per cent. at present). As regards meat in general, meatless days were instituted last spring (up to the present the meatless days have been Wednesday and Friday).

(2) *Compulsory delivery.* — Certain measures of this description were decreed in connection particularly with: cereals not required by the farmer for household use or for the needs of a farm operated on normal lines; milk and dairy produce; oil seeds; to a certain extent to eggs, wood and sugar beets.

(3) *Price control.* — A fairly strict control of prices was established at the moment of devaluation of the Swiss franc in September, 1936. On August 30, 1939, on the eve of the outbreak of hostilities, the Chambers adopted a Federal Decree [1], establishing certain measures intended to guarantee the neutrality and safety of the country and especially giving full powers to the Federal Council as regards all urgent measures. Under the terms of this decree, the Federal Council adopted, on September 1, 1939, an "Act concerning the cost of living and measures for the control of markets" [2], which granted extensive powers to the Federal Department of public economy. By Order I issued on September 2 [3], this Department established the general rule under which no prices could be increased without express authorization (art. 1) or, at least, prohibiting the earning of any profits incompatible with the

[1] Arrêté fédéral sur les mesures propres à assurer la sécurité du pays et le maintien de sa neutralité. *Recueil officiel*, 1939, p. 781.

[2] *Recueil officiel*, 1939, p. 825.

[3] *Recueil officiel*, 1939, p. 828.

general economic situation (art. 2, par. *a*); the order also provided that goods destined for home consumption could not be diverted from their normal use (art. 2, par. *c*).

Briefly, it may therefore be said that the situation of Swiss agriculture and the part played by it since the outbreak of hostilities have been conditioned by the following considerations and facts: (1) the necessity of maintaining production at the highest possible level and of modifying it to a certain extent by developing arable farming at the expense of animal husbandry; (2) the general, and sometimes the specific obligation to place on sale or to consign surplus production to a duly accredited organization; (3) the elimination of profiteering. To these factors may be added the difficulties caused: (4) by the mobilization of a large number of farmers or their employees; (5) by the requisitioning of part of the farm horses for the army; (6) by the shortage of liquid fuels for farm tractors; (7) by insufficient importation and stocks of fodders and other articles indispensable to intensive production, etc., etc.

In connection with point 3 mentioned above, it should however be recalled that war broke out when agriculture was only just beginning to recover after a long period of depression and when prices were still too low. It was undoubtedly justifiable to ask farmers to renounce all profits comparable to those realized in the years between 1916 and 1919. On the other hand, they could not be denied a certain adjustment in prices; in the first place from considerations of fairness; in the second place, to compensate them for some large increases in their costs; and, lastly, in order to induce them to increase their production as much as possible in the general interest of the country.

It may well be said that the results obtained have, from two points of view, been highly encouraging:

(1) *Increase or re-orientation of production.* — With the exception of the first few months of the war, imports of foodstuffs continued for the most part at a more or less normal rate. Swiss farmers, in spite of the difficulties resulting from mobilization, obeyed the orders issued from Berne and mostly put into effect the first two stages of the programme of extension of cultivation as requested. After France's military collapse and Italy's entry into the war, shipments from overseas were blocked or hampered for many months. Then it was that Dr. Wahlen, contemplating the possibility of even a complete cessation of imports, worked out his famous « plan ». According to this plan, if a sufficient supply of food were to be guaranteed for Switzerland's 4,200,000 inhabitants, it would be necessary to increase arable land to a roughly 500,000 hectares, out of a total area of 1,100,000 hectares (a large part of which could only be ploughed up with the greatest difficulty owing to its altitude, the heavy rains and the configuration of the soil). Without going into the question as to whether the Wahlen plan could actually be carried out in its entirety, it may be said that in the spring of 1941 our farmers were asked to undertake a third and large stage by ploughing up another 50,000 hectares. This result was attained and, at the present time, the area in arable land, which in 1934 totalled only 185,000 hectares, is now over 276,000 hectares. A fourth stage of roughly another 35,000 hectares is planned for the coming winter. This increase in arable land, added to a sharp fall in imports of fodder, was undoubtedly bound to lead to a decrease in the country's head of livestock. In April, 1941, there were 863,000 cows, or 47,000 fewer than in the preceding year; 1,584,000 cattle in all, showing a decrease of 111,000; 763,000 pigs, or 196,000 fewer than before. These decreases, which were anticipated, do not yet give cause for alarm and it is to be expected that further reductions will take place during the winter 1941-1942. Everything will be done, however, to prevent these reductions from being too serious; on the one hand, in order to guarantee sufficient supplies of meat and especially of

dairy produce for the population and, on the other, because these products contain a much higher proportion of fats than do cereals and potatoes, while at the same time many experiments have shown the essential part played by fats in diet, especially when winter heating is insufficient.

(2) *Prices and social income.* — As a result of a certain amount of overproduction (or, to put it more exactly, owing to increasing competition from foreign fats and oils sold at cut-throat prices), and also because of difficulties arising in connection with the export of dairy products, the price of milk was recognized as being insufficient before the war. Now the milk supplied amounted alone in round figures to 35 per cent. of the gross production of Swiss agriculture. The change in the situation arising from the war, followed by the drop in production and added to the increase in operating expenses, enabled the Central Union of Swiss Milk Producers to increase the basic price of milk, with the consent of the Federal Council, from 19 to 20 cts. per kg. on November 1, 1939, to 21 cts. on February 1, 1940, to 22 cts. per kg. on April 1, 1940 and to 24 cts. on November 1, 1940. It was possible to maintain this last-mentioned price for a very long time. Nevertheless, the decline of about 6 per cent. in production and the increase in expenses, made it necessary for the Federal Council to authorize a further increase of 2 cts. from November 1, 1941.

Since pigs were fed mostly on imported concentrates, prices hat to be raised rather quickly owing to the shortage of imports of these foods and to the great increase in their price. The initial price was fixed at fr. 1.60 per kg. live weight, the maximum authorized price reaching fr. 2.70 on June 1, 1941.

As regards cattle, the need to increase the slaughtering due to the extension of arable land prevented a sufficient adjustment in prices for a long time in the case of animals from breeders' establishments and especially in that of choice fat stock. During the winter 1940-41 the co-operative society "Swiss Office for the Trade in Slaughter Animals" associated with the Peasant Union, was even obliged to adopt a series of measures in order to prevent a fall in prices: the sale on commission of young cattle, purchase of fatted calves, constitution of stocks of frozen meat. These difficulties were largely eliminated in the spring of 1941 by recourse to green fodder; prices improved considerably and were maintained at a satisfactory level during the summer and autumn.

In order to encourage vegetal production in particular, it was nevertheless necessary to guarantee a satisfactory price especially for potatoes and bread-making cereals. These prices were necessary, moreover, in order to prevent farmers, owing to the shortage of concentrates, from feeding to livestock (cattle and especially pigs), foodstuffs normally used for direct human consumption.

As regards potatoes, although the 1940 crop was very satisfactory, prices of table potatoes were fixed at between 13 and 16 fr. per quintal for the producer according to quality as compared with between 11 and 15 fr. the year before. The 1941 crop yield was considerably smaller, and consequently the prices were raised to between 17 and 20 fr.

In the case of breadmaking cereals, it may be said that, owing to the influence of the long depression on the world market, the prices paid for the quantities taken over by the Confederation had been considerably reduced over a number of years. The price paid for the 1939 crop was still fixed at 36-38.50 fr. per quintal for wheat, but it was increased to 42-44.50 fr. for the 1940 crop and to 45.50-48 fr. for that of 1941. At the same time, the prices for rye and other breadmaking cereals, too low in the past in comparison with that paid for wheat, were considerably raised. It should, however, be observed that these prices are still too low in comparison with those paid for concentrated feeding stuffs on the open market, as well as in view of the great

difficulty of obtaining them. Our peasants have therefore to show a high spirit of self-sacrifice and a high sense of duty in order not to hold back for their livestock large quantities of their breadmaking cereals suitable for direct consumption.

It has also been possible to effect a considerable increase in the prices of other products, such as fruit, eggs, etc. In the case of poultry, however, the sortage and high cost of feeding stuffs led, in 1940 and 1941, to a reduction in the numbers amounting to roughly 20 per cent. in the prices of foreign eggs, in so far as they can be imported, are higher than those of the home product. This last remark also applies at the present time to potatoes, fruit and other products.

At the end of August, 1941, the *index of prices of agricultural products*, as compared with that for the end of August, 1939, had reached 144 per cent. Against this increase of 44 per cent. should be set, however, the index of operating expenses which had increased by 38 per cent. during the same period. Account should also be taken, on the other hand, of the increasing difficulties encountered by Swiss farmers: shortage of labour and draught animals due to mobilization; shortage of some accessory articles leading to a decrease in production; new expenses incurred as a result of the changes which had taken place in production as a whole, etc.

As a result of the research carried out by the Secretariat of Swiss Peasants concerning the social income of agriculture, it was found that the average *net return on farm assets* for the three accountancy years 1935-38 had reached 3.21 per cent. It increased to 3.69 per cent. in 1939-40 and to 4.26 per cent. in 1940-41. It is hoped that the results for 1941-42 will be roughly the same as those obtained in 1940-41.

The above figure of 4.26 per cent. is certainly satisfactory. It is, however, in no way excessive. Indeed, it has been reached after a long period of open or latent depression. It should also be recalled that the re-orientation of production compels farmers to undertake a mass of new work and leads to new expenditure involving serious *risks for the future*. When hostilities cease and international economic relations become normal once more, it is not at all certain that it will be possible to maintain the areas under crops at the exceptionally high levels required in time of war; in this case, many new buildings and machinery purchased at high prices will perhaps have to be abandoned. The land, owing to the present shortage of certain fertilizers, will probably require much new treatment. The decimated livestock will have to be gradually replaced. Will it be possible to prevent the huge stocks of foodstuffs at present accumulating overseas from provoking a collapse of prices comparable to that which occurred in 1922 ? As regards this last-mentioned point, and in connection with others as well, Swiss agriculture has received no definite guarantee and has had to be content so far with vague assurances.

3. Land system and the campaign against the inflation in land prices.

The rise in agricultural prices during the world war of 1914-18 led to a similar rise in the price of land and to excessive indebtedness on many farms. Then came the collapse of agricultural prices: this excessive indebtedness was a burden for many years and is still weighing to-day on the agricultural economy of the country.

If, during the present war, those responsible for Swiss agriculture in no way desire too accentuated a rise in the prices of agricultural products, this is because, apart from considerations affecting the general welfare of the country, they fear a repetition of the evils which followed on the previous war.

Certain legislative measures had, therefore, to be taken, and a start had been made in this direction some years ago.

It may be recalled in the first place that the unified civil code which came into force on January 1,1912, establishes, in articles 620 and seq. the principle that, in the case of *transmission by inheritance*, the farm must be handed on as a whole and at its return value to the qualified heir who claims it. The new "Federal law on the *liquidation of the indebtedness* of agricultural holdings" (1) adopted by the Chambers on December 12, 1940, not only institutes a whole series of measures intended to improve the situation of farms suffering from overindebtedness, but it also provided for certain improvements in the succession laws of the civil code: more especially, the transfer of the holding at the return value in case of inheritance, which was heretofore optional, will become compulsory when a qualified heir claims the farm. It is expected that the new law will come into force in a year or two.

An "Act of the Federal Council of 16 October 1936 bearing upon *transactions in real property*" (2) establishes the principle that farm real estate purchased after January 1,1934 cannot be alienated, either as a whole or in lots, for a period of six years from the registration of the purchase in the land register. This measure puts a brake on speculation. It should be added that this provision reappears, with some additions, in the law concerning the liquidation of indebtedness mentioned above.

Mention should be made especially of the important "Act of the Federal Council bearing upon measures against *speculation in land* and against over-indebtedness, as well as upon the protection of farmers" (3) dated January 19, 1940. The chief aim of this decree is to submit to the cantonal authorities for ratification the validity of all contracts concerning the transfer of ownership in agricultural and forestal real estate of a certain size (as a rule having an area of at least 2 hectares). Ratification must be refused when the sale price is considerably higher than the actual return value or when the agricultural estate would be burdened with an excessive debt. It may be refused when there is reason to fear that the transfer would be prejudicial to economy as a whole, especially when the purchaser is not a farmer. The broker's activity in negotiating the contracts for the transfer of agricultural real estate may only be exercised after receipt of a concession granted by the cantonal authorities. On principle, agricultural real estate cannot be leased for a period of less than five years.

Of the 236,000 farms existing in Switzerland, 18,700 are leased; in the case of 15,000 others, the farmer, although owning some property himself, holds on lease the greater part of the land he cultivates. In the event of a rise in agricultural prices, it is desirable that the *leases* should not increase rapidly, as a risk is incurred that it would not be possible to reduce them later without encountering great difficulties. This risk is also increased because the demand for farms on lease in Switzerland is considerably greater than the supply. Accordingly some legislative measures were adopted shortly after the devaluation of the Swiss franc in 1936. These were completed and defined in Order XI issued by the federal Department for public Economy (4) on July 11, 1938 and in Order XV (5), dated January 31, 1939. Official authorisation

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(1) *Feuille fédérale*, 1940, p. 1417.

(2) *Recueil officiel*, 1936, p. 821.

(3) *Recueil officiel*, 1940, p. 78.

(4) *Recueil officiel*, 1938, p. 350.

(5) *Recueil officiel*, 1939, p. 263.

is needed fo any lease on which the rent is to be increased as compared with that in force on September 28, 1936, or when the property to be leased had not been leased prior to September 28, 1936; the farmer may request that any rent which is obviously excessive be reduced; as a general rule, leases must amount to between 4 and 4.5 per cent. of the return value.

There is no doubt that these various legislative measures have already had beneficial effects, and they are calculated to prevent the risk of a new period of over-indebtedness as a result of the adjustment of agricultural prices due to present conditions. Unfortunately, some of the cantons are perhaps not as strict in the application of these measures as is desirable in the case of a matter of such importance for the real and lasting prosperity of Swiss agriculture and of the country as a whole.

4. Land improvement.

The Federal Government has encouraged and subsidized land improvement ever since 1885. Up till the end of 1937 the Confederation had allotted subsidies for this purpose to the amount of 95,600,000 Swiss francs, the total outlay for improvement amounting to about 380 million francs. The following are the chief improvements carried out: drainage, 80,800 hectares (federal subsidies, 30.6 million francs); reparcelling of land, 91,500 hectares (21.1 million francs); road building, roughly 4 million linear metres (22 million francs). Mention should also be made of subsidies granted for alpine chalets and stables, water supplies, breaking up of land, etc. The increase in the gross return due to these various improvements was estimated to amount to some 50 million francs annually.

A programme drawn up in 1937 shows, however, that the task which still remains to be accomplished is considerable: 72,500 hectares have still to be drained; reparcelling is most desirable over an area of 520,000 hectares.

Land improvement, speeded up in the war years from 1914 to 1918 for the purpose of favouring an increase in agricultural production proceeded later at a normal pace. For reasons of economy, credits had been considerably reduced during the past few years. The outbreak of the present war and the need to increase production led, however, to a change of policy. On February 11, 1941, the Federal Council adopted an "Act providing for *extraordinary land improvements* with a view to increasing the production of foodstuffs" [1]. This decree greatly simplified the procedure for improvements in common and raised the quota of federal contribution. Moreover, in application of art. 13 of the decree, the general Inspectorate of forests decided to break up 2,000 hectares of woodland of little value.

The plans submitted by the cantons on the basis of the decree of February 14, 1941, led to a total outlay of some 260 million francs. It was found possible to retain in this extraordinary programme schemes involving a total outlay of 160 million francs. Unfortunately the shortage of labour and, up to a certain extent also, of materials, delayed the execution of the programme, while the newly improved or broken-up land will not be able to yield its full production at once. The new programme will, however, undoubtedly render valuable services if the war should continue for some years longer.

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(1) *Recueil officiel*, 1941, p. 144.

5. Activities of public and private organizations.

As has been stated under section 2, the new questions which arise in war-time – both in agriculture and in other occupations – have been turned over chiefly to the War Economy Sections specially created for the purpose within the federal Department of Public Economy. These sections are official bodies.

The *agricultural organizations properly so-called* have not therefore had to be called upon to perform new duties. Many of them, nevertheless – such as the Central Union of Swiss Milk Producers, the Fruit Union, the Vegetable Union, the Cooperative Society of the Swiss Central Office for the trade in slaughter animals – found that some of their semi-official duties were confirmed or else that they were allotted some new duties. As a general rule, moreover, war economy measures are taken after consultation with the interests concerned, and with the Swiss Peasant Union in particular, which is the central representative of all the various agricultural organizations in the country.

6. Agricultural co-operation; agricultural credit; social insurance; rural social policy; agricultural labour.

The present war has not brought about any important alterations in the structure and importance of *agricultural co-operation* in Switzerland. For information of this subject reference may be made to what has been said above under section 5.

In the same way, *agricultural credit* has continued to operate as before. Land credit is granted almost exclusively by the cantonal banks, by private banks and by private individuals (relations or friends). The mortgage credit rate, which is moderate in comparison with most other countries, did not require drastic intervention, the more so because the interest rate has shown a recent tendency to fall, since the Confederation and cantonal bonds only bring in 3 per cent. at the present time. Farm credit is granted mostly by the Raiffeisen co-operative banks, distributed throughout the country and now numbering 672, with an annual turnover of over 400 million francs.

Again, no alterations need be mentioned in connection with *agricultural social insurance*. Speaking in round figures, it may be said that two-thirds of the farmers and their employees are insured against *accident*, a very similar proportion being insured against *sickness*. Unemployment insurance would be almost useless and is practically non-existent.

By a popular vote in 1931, the Swiss people refused a bill instituting insurance against old-age and for survivors; rural electors weighed heavily in this refusal. The lack of this form of insurance is felt particularly by employees. At the same time the problem of the *low birth rate*, which is seriously threatening the towns and even affecting many rural districts, is occupying many minds. In 1940, military compensation banks were created for the purpose of rendering assistance to mobilized men in every category. These banks pay mobilized men a daily allowance graduated according to their place of residence and to their family responsibilities. The money is obtained from payments made by non-mobilized men and by the State. Their credit balance at the present time amounts approximately to 150 million francs. It was hoped to maintain these banks, or banks of a similar nature, after the war and to use the funds for various social ends: family allowances, the campaign against unemployment, old-age and survivors' pensions. A recent decree issued by the Federal Council

(October 7, 1941) [1] has, however, decided the matter to a great extent in favour of the campaign against unemployment, so that the other schemes are likely to receive, if anything, only a very small portion of the funds.

Mobilization and satisfactory employment conditions in industry have up to the present made the shortage of *agricultural labour* more keenly felt. Cash wages of domestic servants and day-labourers have increased by 12-15 per cent. since August, 1939. One of the blind spots in Swiss agriculture is the difficulty encountered by farm servants in founding a family. In this connection, the housing shortage in the villages and on isolated farms plays an important part. In a recent publication [2], the Swiss Peasants' Secretariat suggests various means for improving the situation of farm hands and of attaching them to the land. Among the chief measures proposed, is the construction or adaptation of dwellings suitable for farm employees, with the assistance of subsidies from the Confederation and the cantons.

Completed on October 30, 1941.

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BIBLIOGRAPHY ON ECONOMIC AND SOCIOLOGICAL SUBJECTS

PIROU, Gaëtan, Professeur à la Faculté de Droit de Paris: Les cadres de la vie économique. L'agriculture. Le commerce. Bordeaux, 1941, pp. 330.

[This work, which forms part of the "Traité d'économie politique", published by professors PIROU and BYÉ, deals with the recent evolution of agriculture and commerce as well as with their relation to industry. The characteristics of agriculture are considered by the author from three different aspects: technical, juridical and social. Nature plays a predominating part in agriculture which, in the author's opinion, has not been affected by mechanization and specialization to the same extent as industry; in agriculture production is the work of nature, the technique playing only a subordinate part. Industry, on the other hand, is dominated by technical processes, while commerce, in its turn, belongs to the sphere of human and social relations; in this field, psychology is of greater importance than either technique or nature.

The economic evolution of agriculture does not display a tendency, as does that of industry, towards concentration in large undertakings. On the whole, the small farm is still predominant in France as it is, indeed, in almost every European country. "While in industry, says the author, the large mechanical factory, concentrated and specialized, appears to be steadily gaining ground, and the small craftsman, owner and manager of his business, is receding into the background, in agriculture, on the contrary, the movement of ideas and facts seems to lead towards the multiplication of small owner farmers and towards the progressive elimination of the passive owner and the absentee landlord belonging to the aristocracy". (p. 119).

The author examines the relations between owner and farmer from the juridical standpoint, emphasizing the respective advantages of farming ownership, tenant farming and crop-sharing under given circumstances. A detailed analysis is given of recent French legislation concerning inheritance of rural property as a remedy to the excessive breaking-up of holdings.

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(1) *Recueil officiel*, 1941, p. 1152.

(2) Publication n° 126 du Secrétariat des Paysans suisses: Mesures propres à atténuer la pénurie de main-d'œuvre agricole. Brougg, 1940.

As regards the social aspect, the author makes a study of collective action in agriculture, from the point of view of the economic field covered as well as from that of the juridical forms it takes. Special attention is devoted to the various forms of co-operative associations, their nature and the way in which they differ from agricultural syndicates. Like the co-operative associations, agricultural syndicates are the means by which the small farm fights against capitalism on a large scale, but their tendencies are moderate. They do not aim at radically reforming the existing economic order. The author follows the evolution of free and private groups towards occupational organization of a compulsory and governmental character, *i. e.*, towards State corporativism in Germany, England, as well as in France, to judge by certain symptoms, including the transformation on November 17, 1940, of the *Office du Blé* into the *Office national interprofessionnel des Céréales.* Thus, planned economy has been applied in many ways, first in the form of State intervention in times of depression and later as permanent regulation and control.

In the second part of the work a study is made of the historical evolution of trade, the origins of trade, modern trade and commercial concentration, or, in other words, the steady development of large commercial concerns at the expense of retail trade. The study ends with a description of the consumers' co-operative associations, as the most efficient form of collective action in the commercial field; their economic scope and future is also discussed. The author observes that in this form of co-operation there is a curious blend of idealism on the one hand, due to the predominance given to social service over individual gain, and of realism, on the other hand, due to the tribute paid to personal interest.

This work, written with great clearness of style, is rich in content and offers a valuable contribution to the study of the present-day economic problems of agriculture and trade].

M. T.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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AGRICULTURAL ECONOMICS AND SOCIOLOGY

DIRECT FINANCIAL ASSISTANCE TO FARMERS WITHIN THE FRAMEWORK OF THE REGULATION OF THE MARKETS

by Dr. G. Costanzo

SUMMARY: I. General characteristics of the agricultural depression of 1929-32. – II. Systems adopted in some countries for giving financial assistance to farmers: (A) United States of America, (B) United Kingdom, (C) Italy, (D) Holland, (E) Switzerland, (F) Other countries (Germany, Argentina, Australia, Belgium, Finland). – III. Conclusions.

I. — General characteristics of the agricultural depression of 1929-32.

To obtain a right understanding of the characteristic features and trends of the agrarian policies adopted by Governments in recent years and of the marketing regulations, which are the most interesting feature of those policies, we must bear in mind the conditions affecting the agricultural classes after the war of 1914-18, more especially around 1925, a year which marked the beginning of a radical change in their situation, due to the passage from a cycle of deficient world cereal crops to a cycle of over-production (1). The reader will remember that the general agricultural situation declined particularly after 1927 and deteriorated gradually. The farmers were loud in their complaints, even in countries which until then had enjoyed relative prosperity. The depression was not restricted to Europe, as had been the case in the last quarter of the XIXth century; European agriculture was then indeed depressed by the sharp fall in the prices of farm products, unaccompanied by a proportionate decline in costs; but if Europe was then suffering from the competition of the new countries, the latter were benefited by the increase in their exports to the European continent. But in 1930 the depression was general, affecting the overseas countries no less than those of Europe. The marketing of farm products encountered great difficulties everywhere, and prices fell below the costs of production. In 1930 the slump spread to almost all farm products and so rapid was the fall in prices that by the end of that year the prices of the staples had reached to levels which in many cases were

(1) In 1925 the world wheat production amounted to 930 million quintals, a figure already in excess of the previous five year average; in 1926 it rose to 952 million quintals, in 1927 to 1.012 million quintals, and in 1928 it reached a maximum of 1.100 million quintals.

much below those of 1913. In many countries this agricultural price-slump was the most rapid ever experienced, and, with the exception of the period 1920-21, modern economic history offers no example of such a decline. Unable to sell their crops at remunerative prices, the farmers were in some cases unable to purchase even those industrial products of which they were most in need. Thus the depression which so greatly reduced the purchasing power of millions of farmers, reacted very seriously on the markets for manufactured goods.

All students of agricultural questions were at one in recognising that the depression was due to maladjustment as a result of which production had outstripped consumption. Technical improvements, higher yields, the cultivation of new lands, had outrun the growth of demand. On the other hand, that demand was in its turn seriously affected by the depression.

Moreover the war had left in its wake world-wide economic disorganisation which was largely responsible, directly or indirectly, for the general economic disequilibrium.

Monetary fluctuations complicated the situation. No country could escape from the reactions caused by this powerful factor of economic maladjustment in its manifold manifestations, varying from extreme inflation to drastic deflation. Unable to adapt itself rapidly to changed market conditions, agriculture suffered severely from this situation which intensified the disorganisation of the market.

The world war was also followed by a marked tendency on the part of Governments towards economic self-sufficiency accompanied by higher customs' protection. All sorts of measures were taken to favor the development of national agriculture, and protection in this field was on a scale greatly exceeding anything practiced before the war. By raising import duties and multiplying trade barriers an attempt was made to secure price stability within each country.

But however high the tariff barriers behind which the national markets tried to take shelter, it was difficult to isolate the agriculture of a given country from outside influences.

During this period recourse was had not only to tariffs but to all the devices of indirect protection, and while imports were hindered by all sorts of obstacles, many countries introduced bounties on exports. Agricultural exports were encouraged by governments, who subsidised them in a variety of ways.

Encouraged by the many causes to which we have referred — technical improvements, disorganisation of the world market due to the war, monetary fluctuations, the growth of protection — agricultural production increased excessively. The losses caused by the relatively low level of the prices ruling for crops were greatly increased by violent price fluctuations which occurred not only from year to year, but during the course of the same year. These fluctuations were much wider than they had been before the war, and their results were disastrous not only for the farmers but also for consumers. They greatly increased the risks run by producers, causing the income obtained from their crops to vary widely. Their effects were particularly injurious in the months

immediately following the harvest when farmers are forced to sell at any price they can get to meet their liabilities, and when market congestion depresses prices.

All this led to the recognition of the fact that a remunerative price level for agricultural staples and price stability are the fundamental purposes which present agricultural policies must have in view. The Governments realised that the measures heretofore taken, were not such as to provide a durable remedy for the economic maladjustments complained of, and that it was necessary to act directly on the supply and demand of the staples with a view to ensuring market recovery and normal conditions for the farmers.

The previous organisation of the several markets could indeed no longer satisfy producers for three reasons: it failed to assure them remunerative prices, it enabled the middleman to secure exhorbitant profits, it favored price fluctuations. Hence the need of reorganising the markets so as to guarantee prices which are satisfactory to the producers and at the same time in keeping with the purchasing power of consumers. The regulation of the markets and in some cases of production also, by measures gradually introduced in many countries and applied to the leading staples, has made it possible to act on both demand and supply in such a way as to keep prices stable.

Moreover, the new agrarian policies contemplate, in addition to the former points in their programs, the need of securing a normal and stable agricultural income, which alone can assure the continuity of production. The legislation enacted in the United States has this purpose in view.

The equitable distribution of the national income between the several social classes is a problem now claiming the close attention of Governments and the several institutions founded for studying the economic situation have been extending their studies in this field. It is generally recognised that the national income should be distributed in conformity with the real contribution made by the several branches of production to its formation (1). Heretofore the share of that income received by agricultural producers has been far below the contribution made by them to production, owing largely to the fact that they have been insufficiently organised.

Of recent years, many schemes forming part of the so-called planned economy, have been devised for placing farmers on a footing of equality with other producers so as to assure them reasonable standards of living and adequate opportunities for improvement. The systems devised are generally based on the following principles: (*a*) regulation of prices; (*b*) regulation of markets; and, (*c*) regulation of production.

The Governments which have adopted these policies are logically led to intervene in the organisation both of agricultural production and of the farmers themselves, with a view to securing a permanent adjustment between produc-

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(1) See H. BÖKER: "Agriculture's share in the national income, and the agricultural situation". *Monthly Bulletin of Agricultural Economics and Sociology*, No. 1, January, 1941. International Institute of Agriculture.

tion and consumption and thus reducing the danger of agricultural depressions. Only thus is it thought possible to solve the many-sided agricultural problem in a way which meets national requirements.

The methods used for carrying out these policies differ of course with the special conditions prevailing in the several countries; in some the Government not only regulates prices, markets, and production, but also grants direct subsidies to the farmers.

Such government intervention in the field of production and marketing would not, of course, be possible but for the changes which have occurred in the ideas prevailing as to the right relations between the individual, the farm, and the Government, changes which, while they may be rightly considered as a natural result of the trend of the age, were also greatly encouraged by the serious effects on world agriculture of the depression of 1929-32.

Of course, all the methods devised for adjusting the supply of farm products to the demand are somewhat artificial. Frequently, they amount, substantially, to charging to the nation part, if not all, of the cost entailed by their application to special cases; but this is fully justified by the national interest in the proper working of the marketing system on which depends the orderly development of agricultural production.

Alongside of these special forms of financial assistance directly connected with the regulation of markets, the traditional forms of agricultural credit come to the assistance of the farmers. Indeed the forms of assistance we are now considering work as a rule in close connection with agricultural credit systems, which cooperate with them in affording support to agriculture.

In some countries direct Government subsidies to producers are now a feature of agricultural policy, and it will be of interest to examine in the following chapter the different forms taken by government action in this direction.

II. — Systems adopted in some countries for giving direct financial assistance to farmers.

We shall deal more especially with those countries in which this form of assistance has been most widely and methodically practiced.

(A) The United States of America.

The difficulties encountered by the American farmers immediately after the world war, which culminated in the years 1929-32, showed the need in the United States of a national agrarian program such as that embodied in the Act of 1933, amended and completed by the Acts of 1936 and 1938, which, as is known, have as their principal executive organ the *Agricultural Adjustment Administration*.

If the real cause of the serious distress affecting the country's basic industry was not at once recognised by all, nevertheless there was general agreement on one point: the farm income was too low.

In the last twenty years, the rural population has accounted for about one fourth of the whole population, yet the share of the national income obtained by the farmers had been steadily falling from a maximum of 21 % in 1919 to barely 5,7 % in 1932. The receipts of agriculture, which amounted to the record figure of 11,221 million dollars in 1929, fell in 1932, when the depression was at its worst, to 4.682 million dollars (1) Data compiled by the Bureau of Agricultural Economics of the United States show that the receipts obtained from the sale of farm products during the three last decades have been subject to very wide fluctuations. They rose as a result of the reactions caused by the war from 6,251 million dollars in 1913 to 14,436 million in 1919; in 1921 they declined by nearly 40 %, falling in that year to 8,107 million dollars.

To appreciate the agricultural situation in its relation to that of the other branches of economic activity, the income available for living purposes to farmers and non-farmers must be compared. According to calculations made by the Bureau of Agricultural Economics (2), the index number (100 = 1910-14) of the per capita farm income stood in 1932 at 55.6, while that for the per capita income of the non-farm population stood at 90.7, thus showing a disparity of 38.7 % as between the two incomes.

The rise in production costs has done much to lower the ratio between the personal income of the farmers available for living purposes and that of non-farmers. In 1909 those costs absorbed 30 % of the gross farm income; thirty years later, in 1939, they accounted for 47 % thereof.

The main cause of the low farm income (3) was however to be found in the excessive production of some leading staples as compared to consumption, a disparity in its turn due to factors in production and trade both national and international. Only a few years before American farmers had been able to find a ready market for all they produced, and little importance had been attached to the problem of adjusting supply to demand. The foreign market was practically an unlimited one. This situation however had been gradually changing. Foreign trade had declined and American farmers lost their markets. The Department of Agriculture of the United States considers that the narrowing of the export market accounted for about one third of the decline in gross farm income.

This and other cirsumstances favored the accumulation of surplusses causing prices to slump. And as prices fell, the farmers in an effort to keep their

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(1) *The Agricultural Situation*, December 1939 and February 1941. U. S. Dept. of Agriculture, Bureau of Agricultural Economics, Washington, D. C.

(2) *The Farm Income Situation*, Fis.–19, August 1941. U. S. Dept. of Agriculture, Bureau of Agricultural Economics, Washington, D. C.

(3) In addition to relative income levels, the depressed condition of agriculture was shown by the reduction of farm capital, the increase in the number of tenancies, and the spread of soil erosion. See on this subject the chapter "Agriculture in maladjustment" in: DONALD C. BLAISDELL, formerly Assistant to Under-Secretary of Agriculture: Government and Agriculture. The Growth of Federal Farm Aid. New York, 1940.

incomes at their former level, increased their production but obviously by so doing they were causing a further fall in prices. And while the farmers were producing surplusses to be sold at any price they would fetch, the industrial producers, by controlling their output, were in a position for supporting the prices of their products. Agriculture thus found itself at a disadvantage as compared to industry, and when the farmers, in an attempt to eliminate this disadvantage, enlarged the acreage under industrial crops which exhaust the soil, they were thereby undermining national resources (1).

Measures had therefore to be taken for adjusting the supply of the staples to the demand, so as to enable the farmers to secure a larger income. This was the purpose of the Agricultural Adjustment Act of 1938, which amended and supplemented the basic principles embodied in the Agricultural Adjustment Act of 1933 and in the subsequent Act of 1936 on Soil Conservation.

The inability of the individual farmer to carry out such an adjustment was at once recognised, as the scope and complexity of the plan required coordinated collective effort under Government control. Several opinions were expressed as to the best means of carrying such a plan into effect, but finally two solutions were considered possible (2) One consisted in regulating the sale of the crops when already harvested, a solution which the Farm Relief Act of 1929 vainly tried to bring about, the other consisted in adjusting production to actual market demand.

To secure this adjustment the area under certain crops had to be restricted; and in the United States such restrictions ran counter to the traditional rule of unlimited production. On the other hand, there could be no doubt that more than half the fluctuations in the production of the leading staples were due to changes in the area under cultivation. With a view therefore to encouraging greater uniformity in the areas cultivated and to bringing national production into keeping with demand, a system of acreage allotments for the leading crops was introduced. Such allotments have been fixed in most of the years since 1933 for cotton, maize, wheat, rice, tabacco, potatoes, and ground nuts.

Acceptance of these allotments is optional, but the farmers whose crop acreage does not exceed the limits fixed, receive from the Federal Government payments on the normal yields obtainable from such allotments. This is look-

(1) An enquiry made by the Soil Conservation Service of the United States, the results of which were published in 1935, shows that of the total area of 1,903,176,620 acres, 282,218,000 acres were so seriously injured by soil erosion that it would henceforth be impossible to use them to economic advantage for crops or grazing, 775,678,000 acres were so seriously affected by erosion that immediate measures had to be taken to ensure their continued productivity, and 144,768,000 acres, consisted of uncultivated land, roads, and other areas of nonagricultural value. See on this subject H. H. BENNET: "The program of the United States Soil Conservation Service". *Monthly Bulletin of Agricultural Science and Practice*, No. 10, October 1941. International Institute of Agriculture.

(2) See J. B. HUTSON, Assistant Administrator, Agricultural Adjustment Administration: "Acreage Allotments, Marketing Quotas, and Commodity Loans as means of Agricultural Adjustment". In FARMERS IN A CHANGING WORLD. YEARBOOK OF AGRICULTURE, 1940. U. S. Dept. of Agriculture, Washington, D. C. 1941.

ed upon as compensation for loss incurred by them in promoting the general interest. As a rule, these payments are only a partial compensation for the actual loss sustained by the farmer. The funds available for such payments are divided among the growers of several staples in accordance with a formula contained in the Agricultural Adjustment Act of 1938. That Act provides that in making the allotment, account shall be taken (*a*) of the average area planted to the several staples considered during the ten year period 1928-1937, inclusive of the areas withdrawn from cultivation under the respective agricultural adjustment and soil conservation plans; (*b*) of the value, at parity prices ([1]), of the crops obtained on the acreage allotment for the year in which the payment is made.

The 1938 Act also provides for additional parity payments to be made to farmers raising maize, wheat, cotton, rice and tobacco, if and when additional appropriations are made for that purpose. All funds available for parity payments are divided up between the growers of those staples whose acreage does not exceed that allotted, taking into consideration the ratio in which the income derived from each staple falls below parity income.

The second item in the program for adjusting agricultural production to consumption are marketing quotas. Here it is a question of fixing the amount of these products of which there is overproduction which the growers may sell. Sales in excess of the quotas fixed are subjects to a fine. Marketing quotas can be enforced when they have been accepted by two thirds of the farmers of a district as a result of a referendum taken immediately after the said quotas have been notified. The Act Provides that normal production of the several products is fixed on the basis of past consumption plus exports, and the Secretary of Agriculture is empowered to fix marketing quotas when the volume of the products considered exceeds normal by more than the following ratios: cotton 107, wheat 135, maize and rice 110, tobacco 105. ([2]).

Again in this case, as in that above referred to, the financial loss incurred by farmers who accept the sale limitations agreed on, is offset by a subsidy.

([1]) As applied to prices, parity is defined by the Act as that price which will give to the agricultural commodities in question a purchasing power with respect to articles that farmers buy equivalent to the purchasing power of such commodities in the base period, August, 1909, to July, 1914. As applied to income, parity is defined as that per capita net income of individuals on farms from farming operations that bears to the per capita net income of individuals not on farms the same relation as prevailed during the period from August, 1909, to July, 1914.

([2]) Marketing quotas have also been introduced for ground-nuts by the Act of 3rd April 1941, amending for this purpose the Agricultural Adjustment Act of 1938. It was recognised that the raising, processing, and sale of ground-nuts and ground-nut products give employment to a great number of persons and are therefore of national importance; but for reasons beyond their control, the persons engaged in processing and selling ground-nuts are unable to assure regular sales, hence the need of regulation, for the protection of producers, processors, and consumers. This is the purpose of the new Act which provides that all sales of ground-nuts in excess of the marketing quota assigned to a farm raising ground-nuts, and all sales of ground-nuts by farms to which no acreage allotment has been made for that purpose, are liable to a fine of 3 cents per lb.

Experience has shown in the case of the cotton and tobacco crops that this system was effective, more especially as regards acreage allotments. Indeed the area planted to cotton, which stood around 35 million acres in 1932, was reduced to 26-27 million acres by the first plans of the Agricultural Adjustment Administration. It rose to 30 million acres in 1936 and to over 33 million in 1937. Since 1938 the cotton-planters have voted in favor of marketing quotas and the area planted has been kept at about 24 million acres in 1938 and 1939.

With the approval of the program for the conservation of soil fertility and natural resources, as contained in the Act of 1936 and included in the Act of 1938, the system of payments has been more fully developed. Financial assistance to farmers is fully justified in this case as they are required in the national interest to take pledges which they could not carry out or could only carry out imperfectly if unassisted. The Act has in view purposes of wide scope which exceed individual possibilities and have in view the interests of future generations. The purpose is to conserve national resources, prevent the waste of soil fertility, conserve, maintain, and reconstitute the natural wealth of arable land and prairies. The methods of soil improvement considered include such processes as liming, various modes of seeding and improving the land, reafforestation, embanking and earthworks, lateral ploughing, etc., all of which entail considerable expenditure. The subsidies granted to farmers who cooperate in carrying out the agrarian conservation program have placed very heavy burdens on the Treasury. Thus the appropriations for 1940 provided for the following outlays: (*a*) 438,560,000 dollars for agricultural conservation, in addition to any unexpended remainder of the 60,000,000 dollars appropriated for the fiscal year 1940; (*b*) 225,000,000 dollars for the parity payments under the Agricultural Adjustment Act of 1938; (*c*) 47,975,000 for payments to sugar-planters.

The following payments have been made to farmers under the Agricultural Adjustment Act from 1933 to 30th June 1940 (¹):

1933 –	Rental and benefit	$	208,424,000
	Cotton option and pool	»	68,466,000
1934 –	Rental and benefit	»	636,523,000
1935 –	Rental and benefit	»	466,988,000
	Cotton price adjustment	»	39,771,000
1936 –	Agricultural conservation	»	369,218,000
	Rental and benefit	»	45,750,000
1937 –	Agricultural conservation	»	301,514,000
	Cotton price adjustment	»	122,077,000
	Sugar	»	36,199,000
1938 –	Agricultural conservation	»	451,309,000
	Sugar	»	45,157,000
1939 –	Agricultural conservation	»	510,268,000
	Price adjustment	»	211,124,000
	Sugar (partly estimated)	»	46,920,000

(¹) THE AAA – WHAT IT IS. United States Department of Agriculture. Agricultural Adjustment Administration. Washington, 1941.

During the fiscal year ended June 30, 1939 expenditures for the Agricultural Adjustment Administration and related farm programs amounted to 8 per cent. of the total Federal budget.

The average-sized conservation payment earned by the 5 3/4 million farmers who co-operated the 1939 program was approximately 86.40 dollars and the average price-adjustment payment was approximately 38.67 dollars. More than 77 per cent. of all farmers participating in the 1939 program earned conservation payments of less than 100 dollars, and nearly 92 per cent. earned payments of less than 200 dollars (1).

In the five year period 1936-1940 the annual farm income averaged 8,661,000,000 dollars; during the same period government payments averaged 542,000,000 dollars per annum being 6.25 per cent. of that income.

Closely connected with the plan of financial assistance to farmers above referred to, of which it forms an integral part, are the loans on products to which we will now refer.

The program of the Agricultural Adjustment Administration aims at promoting the regular flow of farm products to the markets at suitable prices; but the experience of the drought years 1934-1936 showed the need of holding larger stocks of foodstuffs and fodder. The agricultural program of the United States now provides for this need. It enables farmers to carry stocks of the staples grown for the market (wheat, cotton, and maize) and to store dairy products when there is over-production. The Act of 1938 enables farmers who accept the program to obtain loans on the security of their products. The loans may be made by the Commodity Credit Corporation in those cases in which the price of the products concerned falls, at a certain date, below a given percentage of the parity price or when the last monthly crop report prior to the harvest estimates a quantity in excess of that required to meet normal demand on the home and export markets. Loans on wheat and cotton may range from 52 to 75 per cent. of the parity price. Loans on maize are contained within the same limits, but within those limits they are more accurately graded in accordance with prices and production estimates. Farmers who have not accepted the program can obtain advances on their crops to a limited extent and subject to certain conditions. Loans on maize are only made in the regions where this crop is raised for the market.

What we have said clearly shows that the three features of the system aboved described—acreage allotments, marketing quotas with relative payments, and commodity loans—all combine to regulate the supply of the products and therefore act as factors for stabilising the farm income, bringing it into closer keeping with that of other sections of the community.

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(1) In 1940 the payments made by the Government to farmers to finance the replacement of crops which exhaust the soil by others which enrich it, and the cost of control of soil erosion amounted in all to 672,000,000 dollars. More than 6,000,000 farmers responded to the appeal made by the Government.

B) United Kingdom.

As we have seen, the new agricultural policy of the United States, inaugurated in 1933, follows a prearranged plan of reconstruction with clearly defined purposes and a special executive organisation; on the other hand, the new British agricultural policy which started in 1931, consisted, at least in the early years, in a series of isolated emergency measures, taken as occasion required to meet the special conditions brought about by the agricultural depression in different branches of the farming industry, regardless of any comprehensive plan. Their ultimate purpose was to secure the leading food products a certain degree of independence from the reactions of foreign conditions. Three kinds of measures were taken for this purpose: (*a*) the control of imports of farm products, (*b*) the statutory organization of farmers, (*c*) the grant of subsidies to farmers.

The first group of measures owed its origin to the reactions of the world depression on British agriculture. With few exceptions farm products entered the United Kingdom duty free, and therefore the prices on the British market were practically those of the world market. This was more especially the case for products imported on a large scale such as wheat, butter, bacon, etc. The result was that the condition of the British farmer depended much more on the world situation than on conditions prevailing in his own country, and he was therefore seriously affected by the agricultural depression. But when, in 1931, the traditional policy of free-trade was abandoned and protectionist measures were taken, the agricultural situation began to improve.

The second group of measures dealt with the statutory organization of the farmers. It had at its basis the Agricultural Marketing Act, 1931, and consisted in the acceptance by the farmers concerned of a marketing scheme for a given product. The scheme had to be drafted by the farmers themselves or by an organization representing them and only after it had been approved by a referendum held for that purpose by the farmes did it take effect. Marketing schemes were thus adopted for hops, potatoes, milk, bacon pigs, and bacon [1].

But the policy of direct financial assistance to farmers was that to which most importance was given. Limited at first to wheat, under the Wheat Act of 1932, the system of " deficiency payments " was extended to oats and barley, while other forms of direct Government assistance were applied to other products.

The purpose of that Act was to afford wheat farmers a safe market and secure for them higher prices for home-grown wheat sold to the mills. A standard price was fixed per quarter. The farmers sold their wheat on the free market, and afterwards the average price paid during the year for wheat sold to the mills was calculated. The farmer was entitled to receive at the end of the year a deficiency payment i. e. a sum equal to the difference between the average price

(1) For further details on the organization and working of marketing schemes, see The World Agricultural Situation in 1931-32 and following volumes. International Institute of Agriculture.

for each quarter of wheat sold to the mills and the standard price. The reduction of the deficiency payment was foreseen, should the quantity of wheat marketed exceed a certain figure. Each year the Minister of Agriculture estimated the quantity of wheat which he expected the growers to sell during the year. If the quantity actually sold exceeded that estimate, a pro-rata reduction was made in the deficiency payment.

To provide the funds for the deficiency payments millers and flour importers were required to pay a fixed quota on all the flour milled or imported.

The following table shows the subsidies granted on the wheat marketed in the years 1932-33 to 1937-38.

Wheat Supply and Subsidy.

	1932-33	1933-34	1934-35	1935-36	1936-37	1937-38
"Anticipated Supply", hundredweight . . .	19,800,000	29,000,000	32,000,000	30,400,000	25,750,000	25,000,000
Actual sales by registered growers, hundredweight	20,400,000	29,570,000	35,720,000	33,650,000	23,713,000	24,550,000
Ascertained average sale price per hundredweight	5*s.* 4.46*d.*	4*s.* 7.63*d.*	4*s.* 10.87*d.*	5*s.* 9.23*d.*	8*s.* 8.92*d.*	8*s.* 4.39*d.*
Deficiency payment made by Wheat Commission, per hundredweight (1)	4*s.* 5.25*d.*	4*s.* 10.30*d.*	3*s.* 9.55*d.*	3*s.* 4.26*d.*	1*s.* 1.53*d.*	1*s.* 7*d.*
Average return to growers, per hundredweight	9*s.* 9.71*d.*	9*s.* 5.93*d.*	8*s.* 8.42*d.*	9*s.* 1.49*d.*	9*s.* 10.45*d.*	9*s.* 11.32*d.*
Total payment to growers by Wheat Commission, pounds sterling (2)	4,511,000	7,178,500	6,814,000	5,644,000	1,338,000	1,943,000
Product of average return and actual sales, pounds sterling . . .	10,005,350	14,037,126	15,628,195	16,720,038	11,703,354	12,205,442

(1) On an amount not exceeding the "anticipated supply". — (2) Approximate.

The special treatment granted to wheat farmers led to the demand for like treatment by other branches of farming. In compliance with his demand the Agriculture Act of 1937 provided for a payment to oat growers, should the price of oats fall below 8*s.* per quarter. This grant, which the Act fixed at six times the difference between the current market price and 8*s.* with a maximum of £ 1 per acre, was raised by the Agricultural Development Act of 1939 to fourteen times the difference between the two prices with a maximum of £ 2.6*s.* 8*d.* per acre. This grant was payable in addition to any other payment the grower

might receive for his wheat. But in such cases the grant would be made at the original rate of 6 times the difference between the two prices with a maximum of £ 1.

The total amount was limited by fixing a maximum area on which it is payable, fixed by the 1939 Act at 2,500,000 acres.

Should the total area exceed this maximum, payments are reduced proportionately.

The maximum amount the Treasury was authorised to spend in any one year on such payments was fixed at £ 4,500,000.

Measures have also been taken to assist barley growers. The Agriculture Act of 1937 had already provided that when a payment is made to oat growers, a similar payment can be made for barley. This payment was based on the price of oats but could not be made to farmers receiving deficiency payments for wheat. The Agricultural Development Act of 1939 provides a deficiency payment for barley financed out of the proceeds of a levy on brewers and importers of beer at a fixed rate per unit brewed or imported. The rate is fixed in relation to the price ruling for barley and the yield provides a fund for making deficiency payments to barley growers.

There is an important difference in the method employed in the case of these two cereals and that used for wheat. The payments to oat and barley growers are not made on the sales of their product, as in the case of wheat, but on the area cultivated.

Since 1924 the sugar-beet crop has been promoted by a subsidy on sugar produced in the country. The most recent regulation regarding this industry is based on the Sugar Industry (Reorganisation) Act of 1936, which provides financial assistance in the form of payments to the British Sugar Corporation Ltd. out of funds voted by Parliament, for each cwt. of sugar manufactured in Great Britain. The Minister of Agriculture fixes each year the rate per cwt., known as the " prescribed rate " for white sugar. The " prescribed rate " is the standard rate fort the grant in aid to producers of sugar.

As soon as the first symptoms of the economic depression made themselves felt, the Government hastened to take measures in aid of the cattle-industry. In 1934 Parliament enacted the Cattle Industry Act which provides a fund known as the " cattle fund " to which the Treasury was empowered to make advances during the financial year terminating on 31st March, 1935 not to exceed £ 3,000,000. The ministries concerned were authorised to draw on this fund for making payments to cattle-breeders, not to exceed 5*s*. per cwt. on live and 9*s*.4*d*. per cwt. on dead animals. To ameliorate the conditions of British producers of beef, another measure was enacted in 1935, and in 1937 the Livestock Industry Act was passed which confirmed the system of payments to cattle-breeders. Native cattle are classified in two grades: on the first a payment is made of 7*s*.6*d*, on the second of 5*s*., with lower payments on imported cattle. The payments made since 1934 have averaged £ 4,000,000 a year. The maximum provided for under the Act is £ 5,000,000 per annum.

The Bacon Industry Act of 1938 provided the following system for assisting bacon-curers. The " ascertained sales price ", i. e. the price actually to

be received by bacon-curers for their product, is fixed. Should the "ascertained price" fall below the guaranteed price, the Government makes up the difference; should the "ascertained price" be higher than the guaranteed price, the bacon-curer is required to pay the Government an amount equal to the said difference.

The Agricultural Development Act of 1939 makes arrangements for sheep, similar to those mentioned for cattle. The average monthly market prices are officially ascertained, and should they fall below the fixed standard price, the Government makes up the difference. The aid thus given is limited to a maximum of 27,000,000 head of sheep. If in any year the number of sheep should exceed that figure, the rate of payment will be reduced pro rata.

Subsidies on milk used for making butter and cheese were introduced in 1934 under the Milk Act, and have been maintained since. Under the Milk Industry Act No. 2, 1939, these subsidies guarantee minima prices of 6*s*.1*d*. per gallon in winter and 5*s*.1*d*. per gallon in summer on milk used for making butter, and of 6*s*.3*d*. per gallon and 5*s*.1*d*. per gallon respectively on milk made into cheese.

The quantity of milk on which subsidies are payable may not exceed 125,000,000 gallons for each purpose.

These subsidies, first introduced in the United Kingdom as a temporary aid to the producers of certain products most seriously affected by the depression, may now be considered as in the nature of permanent assistance.

C) Italy.

The organisation of the market for agricultural products, which is one of the fundamental objects of Italian agricultural policy, is characterised by the delivery of staple products to pools and their collective sale. It aims at assuring remunerative prices to farmers so as to encourage production in view of the growing food requirements of the country. This system was first introduced in 1936 for wheat, and has since been gradually extended to all the cereal crops and to certain other products. It has been of special benefit to small producers who are those most in need of protection against speculation. But with the change in the situation, the balance between costs and prices has been disturbed; the scarcity of some raw materials, transport difficulties, and a labour shortage have greatly contributed to raise costs. Now if, under these changed conditions, prices had remained stable, it would have had a depressing effect on production. On the other hand, a rise in prices would have reacted to the injury of consumers, more especially of the poorer classes. This made it necessary for the Government to act in the interests of production and consumption, and led to the introduction, in the case of the leading staples, of a special form of subsidy by which the Government compensates the producers for the losses due to the prices paid by consumers being left unchanged. The grant of these "supplementary payments" was first made in 1940 on wheat, and has since been extended to all cereals, beans, oils, edible fats, and cattle sold to the slaughter houses.

In the case of cereals and beans the supplementary payments have been fixed at the following rates:

For wheat: a supplement of 20 lire per quintal (100 kg) in addition to the basic price of 135 and 150 lire paid respectively for soft and hard wheat. Taking into account the quantities delivered to the pools, it may be reckoned that these supplementary payments have benefitted wheat-growers to the extent of some 700 million lire per annum. In the case of maize, a supplementary payment of 22 lire is made on the basic price of 98 lire per quintal; for paddy, 30 lire on the basic price of 100 lire; for oats and rye, 15 lire on the basic price of 120 and 135 lire per quintal; for barley, 20 lire on the basic price of 125 lire; on beans, 25 lire on the basic price of 135 lire.

Further, the Government meets the cost of a bonus of 200 lire for each hectare of land sown to wheat, rye, or barley. On the basis of the normal average area sown to those cereals and of the probably increase which may be made thereto, the bonuses payable on the 1942 crops will entail a cost of over 1,100 million lire.

The Government is also pledged to follow production costs during the growing season so as to ensure, by suitable price policies, remunerative prices to farmers.

Following the example set in the case of cereals and beans, and with a view to correcting, in the interest of olive-growers, the disparity which had arisen between the cost and the sales price of olive-oil, the Government makes the producers a supplementary payment at the rate of 100 lire per quintal of oil. For animal fats, the supplementary price has been fixed at 3 lire per kg.

A similar measure has been taken in favor of cattle-breeders; they receive an additional payment on the price of each kilogram (live weight) of cattle delivered to the slaughter-houses, at the respective rates of lire 1.15, 0.90, and 0.60 for the three standard grades. This will cost the Government approximately 500 million lire per annum.

The total cost to the Government of these various forms of assistance will amount to some 2,000 million lire per annum.

These price policies place all the leading branches of agricultural production on a footing of equality, thus securing a well-balanced farm economy.

D) The Netherlands.

The agriculture of the Netherlands, in which the export trade plays a leading part, encountered special difficulties during the years of depression. A considerable portion of the products of the live-stock and horticultural industries had to be exported to countries such as Germany, where efforts were made to raise home production to meet home needs, or to countries such as Germany, England, Belgium, and France, which hindered imports by import quotas or duties; or whose depreciated currencies created great difficulties to imports from the Netherlands, whose currency was still on the gold basis. Like circumstances adversely affected such staple products as potatoes, onions, ornamental plants, raised for the export market, seeds, etc. produced in quantities exceeding the

requirements of the home market. The situation was such that if, for instance, the prices for the products of the live-stock industry had been left to find their own level [1] some 250,000 peasant-farmers would have been reduced to a state of destitution, some 400,000 farmers would have been unemployed, and the population of the rural districts, directly connected with agriculture, i. e. 35 per cent. of the Dutch population, would have fallen into a poverty-stricken condition, to say nothing of the indirect consequences, which would have led to the almost complete disorganisation of agricultural production.

Faced by this situation, the Government decided to come to the assistance of the farmers whose interests were so seriously threatened. From 1931 on, several measures were taken providing subsidies to producers, so as to enable the farmers to meet the essential costs of production. Wheat and sugarbeet growers, wool-spinners, potato-flour mills, the breeders of dairy-stock, etc., have largely profited by such assistance. An Act of 5th May 1933 coordinated the several measures for granting assistance, and set up an " agricultural crisis fund " which took over the receipts of the " crisis funds " for the dairy and the pig-industries, part of the receipts provided under the Wheat Act, and the excise and other duties raised on certain products.

With the aid of these funds, measures were taken to assist the industries affected, and in some cases loans were granted. The total annual income of the fund largely exceeded 100 million florins.

In return for the subsidies granted, the Government had the right to lay down rules regulating the volume and quality of production, the volume of exports, etc. The ultimate end in view was to adjust production, by the judicious grant of subsidies, to the limited demand of the home and foreign markets.

The Government also had the right to raise excise and other duties on the products affected by the depression to the extent necessary to cover the difference between home and foreign prices. Special measures were taken for the assistance to small farmers, only a small part of whose products enter trade channels, and who therefore derived less benefit than did the larger farm businesses from the measures above described. Direct grants were made to them in cash and farm implements, fertilisers, cattle-feed, etc., subject to the condition that they should act on the advice given them by a special body of government inspectors. This measure differed from the others in as much as it involved assistance personally to the farmers concerned and not to the cultivation of definite products.

The general system of financial assistance to agriculture continued in force, with but few modifications, until the outbreak of hostilities. But when, in September 1936, the Netherlands were forced to abandon the gold standard, and home prices declined slightly in relation to those ruling on foreign markets, it became possible somewhat to simplify government intervention in this field, while at the same time giving it a permanent character.

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[1] See the chapter on the Netherlands in the volume THE WORLD AGRICULTURAL SITUATION IN 1932-33.

E) Switzerland.

In Switzerland the principle of direct financial assistance to farmers has recently been applied in a new and interesting manner in the form of crop bonuses. In a message addressed to the General Assembly in 1938 the Federal Council proclaimed the need of extending the area under crops. (¹). By so doing, livestock and dairy production, which in normal times exceeded the demand on the home market and could only be exported with great difficulty, would be reduced. The fundamental need was to achieve a reorientation in agricultural production so as better to adjust to the needs of the country. It appeared that the best means for securing this result would be to establish a " fair parity " between the prices ruling for field crops and those for products of animal origin, more especially milk. This is the purpose which the Federal order of 6th April, 1939 has in view (²). It provides for the payment to farmers raising oats, barley, and maize of a bonus for the purpose of reducing the difference between costs and prices. The bonus may not, as a rule, exceed 200 francs per hectare. In mountain districts, and, exceptionally, in other districts were conditions render difficult the cultivation of the crops, a supplementary bonus of 50 and even of 75 francs per hectare may be granted when oats are raised. In fixing the amount of the bonus, the conditions of production and the state of the growing crops are taken into account. The amount of the bonus, fixed each year by the Federal Council, may be graduated. An order of October 15, 1940 fixed the following amounts: oats, barley, maize, sarasin and millet, not to exceed 60 francs per hectare in valley and 120 in mountain districts; oil-seed and textile plants, not to exceed 75 francs per hectare in valley and 150 in mountain districts.

The Federal Council may issue general measures for directing agricultural production, and may fix the extent to which each farm participates in the reorientation of production.

Costs are covered by levying a duty of 2 francs per 100 kg. on receipts arising from the additional prices collected by the Federal Customs'on a certain number of imported fodder.

F) Other Countries.

We have so far dealt with some countries where the new system of granting assistance to agriculture has found a wide application, extending to cover several branches of agricultural production. In other countries the system has only

(¹) Under the plan drawn up by Dr. Whalen for securing adequate food supplies for the 4.2 million inhabitants of Switzerland, the area under field crops would have to be brought up to 500,000 ha., on a total area of 1.1 million ha. The present field area has been raised from 185,000 ha., at which it stood in 1934 to 276,000.

(²) See: International Chronicle of Agriculture: Switzerland. In the *Monthly Bulletin of Agricultural Economics and Sociology*, August 1939, March 1941 and January 1942.

been applied to a single branch which, on account of special conditions, claimed assistance. Such has been the case in Germany, Argentina, Australia, Belgium, Finland, and elsewhere.

In *Germany* prior to 1933 agriculture was protected by customs'duties, price support measures, the requirement that home grown raw materials be used for certain purposes, import prohibitions (frozen meat), the centralisation of imports (the maize monopoly, etc.). In 1933 a complete change was made in the agricultural policies of the country. The large number of isolated and ill-coordinated measures which existed until then, were replaced by an agricultural policy drawn up in conformity with a systematic plan which aims at maintaining and increasing the yield of the farms and at conserving a healthy agricultural population. Of fundamental importance for the new agrarian policy was the Act of the Reich of 13th September 1933 setting up the Food Corportion (*Reichsnährstandgesetz*). This Act afforded the basis and laid down the coditions required for the regulation of marketing, i. e. the controlled organisation of agriculture. In particular, the following markets have been regulated: cereals, oils and fats, milk and dairy products, live-stock, butchers'meat, eggs, fruit and vegetables, potatoes, wool, hops, wine, seeds, flour, and some other products.

The regulations made for all these markets had the same end in view, the adjustment of production to demand by means of fixed prices established on the base of a basic price, and fair i. e. adequate prices for the farmer which should also be within the means of the consumer. Wide price fluctuations, which are injurious to the interests both of the farmer and the consumer, had to be eliminated. By fixing prices at levels which would ensure a correct ratio between the several kinds of farm products, agriculture would be enabled to pursue a long-term production policy and could take all the measures necessary to increase production.

Such a general regulation of markets, based on the aforesaid principles, and guaranteeing for all agricultural products regular and stable conditions as regards prices and sales, evidently did not call for Government intervention similar to that practiced in the other countries to which we have referred. Nevertheless, in special cases, recourse has been had to subsidies, more especially for promoting the production of certain items so far produced in the country in inadequate quantities.

In *Argentina*, at the end of 1933 the value of plant and animal production had fallen considerably, as a result of the price decline on the world market, and home prices fell 33 per cent. as compared to the average price level in 1929. The Government therefore took a series of measures [1] for securing a better distribution of the national income in the interests of agriculture. In the period 1933-35 five market regulating commissions were thus set up for cereals, meat, dairy products, wine and cotton.

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(1) See on this subject the volume THE WORLD AGRICULTURAL SITUATION IN 1934-35, p. 141 et seq. and the same publication for the year 1938-39, p. 137 et seq.

This extensive regulation ([1]) succeeded in relieving a situation which was growing more critical each day. For the protection and encouragement of national agriculture the Government has also had recourse, when necessary, to subsidies. Thus an Act of 7-17 October, 1938 empowered the Executive to grant subsidies to growers of wheat, maize, and wool, so as to support these important branches of production. Thus also, at the end of 1938, the national *Junta* for cattle and meat recommended that a bonus be granted on sales of oxen for immediate delivery to the slaughter-houses, and the recommendation was put into effect by a decree of 8th December of the same year.

The principle of Government intervention on the markets has been given effect in *Australia* in the case of a large number of products, and of late more especially in the case of wheat, which ranks next to wool as an export commodity. Perhaps of all branches of Australian agriculture, wheat growing has suffered most severely from the depression, and producers have always been granted some compensation to offset unduly low prices. In a memorandum published towards the end of 1936 the Commonwealth Publicity Officer summed up the direct assistance given by the Federal government in the following figures:

1931-32	Bonus of 4 ½*d.* per bushel	£	3,414,000
1932-33	Direct grants to farmers	»	2,000,000
1933-34	Direct grants to farmers	»	3,000,000
1934-35	Bonus of 3*d* per bushel	»	1,524,000
	Grant of 3*s*. per acre seeded	»	1,945,000
	Special grants	»	573,250
1935-36	Grants to the States	»	1,878,906
		£	14,335,156

Assistance has also been given to other primary industries during the five years terminating in 1938, at the following cost: £ 1,606,000 for chemical fertilisers, £ 607,000 for the fruit growers, £ 494,000 for cotton, £ 1,176,000 for wine exports.

The Commonwealth Government has thus endeavored to place the staple crops on a more favorable footing so as to enable them to withstand the effects of any serious slump in prices.

In *Belgium* production bonuses have been granted to wheat growers since 1933, so as to limit the losses incurred by farmers as a result of sharp price falls.

In *Finland*, bonuses for the production of sugar-beets were given in 1936, 1937, and 1938, amounting to 2 million marks in each of the first two financial years, and to 4.5 million marks in the third year.

([1]) This organization has since been partially modified by the establishment of the General Directions of Wool and Vine Culture, and the Direction of the Milk Industry.

III. — Conclusions.

More than once in our enquiries into the more deep-seated causes of the last great agricultural depression we have had to recognize that they were largely to be found in the intrinsic features which distinguish agriculture from other branches of economic activity. Briefly, these features are that agriculture is strictly dependent on its physical environment, and that farming is carried on by a large number of farms scattered over a wide area. The former of these two features makes it impossible to foresee the ultimate results of the agricultural enterprise, both as regards crop-yields and the income secured thereby. The latter feature makes it difficult to coordinate by ordinary means the activities of the several enterprises and to control their production. Quite different is the situation of industry, working under a centralised system which can accelerate, retard, or modify the rate of production, adjusting it to estimated market demand, or to changes in customs' or fiscal policies. The two forms of activity differ also in the manner in which the prices of their products are formed. Agricultural costs are only indirectly related to prices, as the unit yield is subject to variations which cannot be foreseen. On the other hand, the price of industrial products is closely related to costs.

Agriculture is thus placed at a disadvantage as compared to industry, and has less power of resistence, as can be observed more especially in periods of depression. This accounts for the need of Government action to sustain farm prices in times of severe depression and to reestablish the balance between farm and other incomes.

The forms taken by Government action vary to meet the needs either of decongesting the home market when depressed by overproduction, or of supplementing insufficient home-production. The means employed in either case are well known and we will not describe them again.

Suffice it to mention that the principal measures taken to meet the wheat depression of 1929-32 in the overseas exporting countries consisted in securing a more rational organisation of production and marketing. The European importing countries, on the other hand, with the exception of Great Britain, then still faithful to free trade policies, had recourse to the most varied forms of protection, ranging from prohibitive customs' duties to restrictions on the milling of imported wheat, export bonuses, etc. In some countries, agriculture was protected by introducing a more or less complete monopoly of the trade in cereals. Lastly, the agricultural exporting countries of East Europe, keenly interested in the European market for their products, tried to overcome the difficulties of that period partly by internal measures and partly by international agreements which aimed at ensuring economic collaboration among themselves and at securing from the other European countries some advantages as a result of wider international action.

But the problem of disposing of surplus products remained practically unsolved. This was due to its complex nature which made itself felt especially in the case of great quantities of products for which it is not easy to find a use.

The situation of the wheat stocks in the United States affords an interesting example of the importance of the problems involved. On 1st July 1925 the stocks of wheat carried over from the 1924 crop amounted to 35 million quintal; they remained approximately at this level until 1928 to increase to 68 million in 1929, after which they began rising to 85 million quintals in 1930, 93 million in 1931, 111 million in 1932, the largest held since the great war. In the following five-years period, 1933-38, stocks were substantially reduced, but they again rose in 1939 to 87 million quintals. In that year the great exporting countries held wheat surplusses sufficient to cover all world import needs for a couple of years.

In some cases, as is known, an attempt was made to secure market equilibrium by destroying the crops: a typical instance is afforded by Brasil where, during the period from June 1931 to December 1940, 42.6 million quintals of coffee were thus destroyed. (1)

With a view to adjusting production to demand by regulating future supply forming reserves to be used in periods of deficiency, and for stabilising at a fair level the prices paid to farmers, the United States devised and enacted the Ever-Normal Granary under the Agricultural Adjustment Act of 1938. (2)

Another means to which the United States Government has recourse for assisting farmers to dispose on the home market of their surplus products while at the same time favoring consumers, is the Food Stamp Plan which raises the purchasing power of families in receipt of government relief (3) and other subsequent efforts of the same kind such as the Cotton Plan Stamp, and the Cotton Mattress Plan.

But as many of the methods devised for regulating the flow of products to the markets either proved of little practical value, or else had disastrous economic consequences, such as the destruction of crops and the denaturalisation of products, it was thought that a solution should be found by direct action on the supply of products through the control of the areas cultivated, of production, and of sales. Among the measures devised for this purpose we have in the United Kingdom the deficiency payments, in the United States the soil

(1) A. Di Fulvio: World statistical situation of coffee. Extract from the *Monthly Crop Report of Agricultural Statistics*, May and June 1941. International Institute of Agriculture.

(2) See: International Chronicle of Agriculture: United States. *Monthly Bulletin of Agricultural Economics and Sociology*, November 1941.

(3) This plan is carried out with the help of a subsidy paid by the Federal Government to low income consumers in the form of blue stamps. These stamps can be used for purchasing from retailers specified foodstuffs of which there is a surplus on the market. The foodstuffs are given away free of cost on condition that a certain number of other orange colored stamps be purchased, which can be used for buying any kind of food. This condition is laid down so as to maintain unchanged the usual expenditure on food of the stamp-holders, so that the acquisition of the surplus products may represent for them an addition to their normal consumption. For more details see Economic Analysis of the Food Stamp Plan. A Special Report by the Bureau of Agricultural Economics and the Surplus Marketing Administration. United States Department of Agriculture. Washington, D. C., 1940.

conservation or parity or price adjustment payments, in Italy price supplements paid by the Government, in Belgium and in Switzerland the crop bonus, in the Netherlands the various forms of support given to farmers, etc.

This new mode of subsidising agriculture led in some countries to the promotion of production so as to bring it up to the level required by home needs; in others again it helped to reduce over-production for which an outlet could not be found on foreign markets. In all cases it served the purpose of adjusting supply more closely to demand. The results obtained appear on the whole to have been satisfactory (1) and we may therefore consider that this new instrument of agricultural policy will continue to be used. Undoubtedly it entails a heavy financial outlay, which however need not necessarily be charged to the Government, as the means required for paying the compensation or indemnities could be secured by levying special taxes on sources of income other than agricultural. In any case, the benefits obtained by the rural population as the result of securing safe markets for their leading staples, fully justify the high cost of this form of assistance to agriculture, a form which experience may well improve.

The system does not involve loans which have to be reimbursed with interest, nor are the payments always in the nature of free subsidies. In many cases, indeed, the beneficiary who has agreed to accept a given plan of farm work is required, in exchange for the compensation or indemnity received, to do or abstain from doing something, and he therefore makes an express or implied return; failure to do in many cases entails the payment of a fine.

We have deemed it worth while to examine in this article this means of affording support to agriculture, and we believe it will be worth while to follow its further developments, so as to ascertain if and to what extent it can help to adjust agricultural costs, prices, and incomes.

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(1) For the United States, see on this point the paragraph dealing with the results of the control of production in BLAISDELL, *op. cit.*, p. 46.

INTERNATIONAL CHRONICLE OF AGRICULTURE

URUGUAY ([1])

SUMMARY: 1. General view of the agricultural production in Uruguay and of its trends before and after the outbreak of the present war. – 2. Foreign trade (*evolution, control, treaties and trade agreements*). – 3. Policy in connection with the home market for agricultural products. – 4. Policy in connection with agricultural production (*evolution and encouragement*). – 5. Work of public and private organizations connected with agriculture. – 6. Co-operation. – 7. Agricultural credit. – 8. Agricultural insurance. – 9. Social policy.

1. General view of the agricultural production in Uruguay and of its trends before and after the outbreak of the present war.

In Uruguay, where agriculture occupies a predominant position, farming conditions present features which differ fundamentally from those ruling in European countries. The abundance of excellent natural pastures, together with the low density of population which, although the highest in South America, amounts to only 12 inhabitants per square kilometre, have created a system of extensive farming producing mainly meat, wool, hides and leather.

The product of the area sown to cereals, fruit trees, etc., representing 9.4 per cent. of the total area of the country, is utilized chiefly for supplying the home market, although in good years the export of some of the products brings in considerable sums. An exception to this rule is flax, which is grown for export, Uruguay occupying the third place as a supplier of linseed.

The total area of the country is 18,692,500 hectares, the latest agricultural census showing that this area is distributed as follows:

Natural meadows	12,600,052	hectares
Artificial meadows	361,461	»
Natural and artificial forests	601,276	»
Farm crops	1,756,543	»
Unproductive land (comprised in agricultural and stock farms)	1,416,644	»

The area of productive land thus amounts to about 15,319,334 hectares.

Generally speaking, it may be said that the picture drawn above has not altered since the outbreak of hostilities, as Uruguay has always been able to place her raw ma-

([1]) See *Monthly Bulletin of Agricultural Economics and Sociology*, September, 1939, pp. 438-448 and April, 1940, pp. 161-171, International Institute of Agriculture, Rome.

terials on the home and foreign markets in the same measure as in the past and, in fact, at the present time there is even a considerable increase in the export of animal products (wool and meat). In spite of this, the Government has taken steps to regulate and coordinate the various types of production in such a way as to make it possible to intensify the production of articles most in demand when the occasion presents itself. Special preventive measures have also been adopted on the home market in order to maintain normal economic conditions should the situation become worse in the future. These measures have, however, been taken exclusively in connection with agricultural production. Conditions as regards industrial production are different. Factories for the transformation of agricultural products (vegetable oils, cloth, leather) and other types of factories (metallurgical, mechanical) have of late acquired considerable importance. Many articles, however, were supplied by European countries, so that there is a certain shortage of some products on the market.

2. Foreign trade.

Evolution. — Although there has not been any striking change in the general volume of foreign trade as a result of the present conflict, the traditional trade currents have been radically altered.

The figures given below confirm this statement and also make it possible to observe an increase in exports:

Year	Imports	Exports
	in millions of pesos	
1936	66.0	90.2
1937	79.9	98.9
1938	74.9	96.3
1939	66.0	101.4
1940	74.2	110.5

The loss of a large part of the European market and the increased selling possibilities in the countries of the North American continent have shifted Uruguayan foreign trade towards these countries, especially in the field of exports.

Control. — Uruguay's foreign trade was carried on the basis of two different exchange rates for each foreign currency: the controlled rate of exchange, and the free rate of exchange. These rates of exchange served to direct imports preferably towards given countries on the principle of bilateral trade agreements, of treaties, of favourable trade balances, etc. and also helped to facilitate the sale of exportable production. This system has remained unaltered, the change registered being in the products exported and the countries of destination. As a typical example of this, mention may be made of the fact that at the present time the country has a credit balance in dollars due to a considerable increase in sales made by Uruguay to the United States of America.

Treaties and trade agreements. — Since the outbreak of hostilities trade agreements have been signed with Bolivia and Paraguay, and agreements already concluded have been ratified with Switzerland, Japan and Canada. Two important treaties are at present being negotiated with Argentina and the United States.

3. Policy in connection with the home market for agricultural products.

Government activity in this field has been directed towards an attempt to effect a balance between the prices of the various types of production. In the first place the authorities have sought to guarantee sufficient profit to producers and to adjust their interests to those of home consumption and exportation.

With this end in view minimum and maximum prices, as well as bonuses, have been established both for exports and imports.

As regards minimum prices it should be mentioned that the cereal and flax crops in 1939-40 and 1940-41 have suffered from adverse weather conditions, with the result that 92,000 tons of wheat had to be imported in 1941. In spite of the shortage of this cereal the minimum price for home grown wheat was fixed at 7.50 pesos per 100 kg. (minimum prices fixed previously had rarely exceeded 5 pesos). In order to prevent consumers from suffering from such a high purchase price for the raw material, millers were paid a bonus of 1.70 peso per 100 kg., the cost of which was covered by the profits from the sale of wheat imported from Argentina and sold to the millers at 5.80 pesos per metric quintal.

Minimum prices for the flax harvested in 1939-40 were fixed at 8.60 pesos per 100 kg. the minimum price for the 1940-41 crop being 7.45 pesos. The Government paid adjustment bonuses for the purpose of facilitating exports. Minimum prices were also fixed for oleaginous plants which have become very popular with farmers in recent years; the price of sunflowers was fixed at 8 pesos par 100 kg. and that of groundnuts at 11 pesos.

The rice crop was abundant in 1940 and there was a surplus for export. Sales were controlled by fixed minimum prices of 8.20 and 10.20 pesos per 100 kg. for the "Japanese" and "Blue Rose" varieties respectively. The 1941 crop, which had looked very promising, was severely damaged by the autumn rains and the amount harvested was 30 per cent. below the estimate. It was therefore not necessary to fix a minimum price for this crop.

As regards the price of the other cereals, oats, barley, maize, etc., producers were guaranteed an adequate profit by the adjustment of imports of these products (the crops of which were also poor) in such a way that the amount consumed made it possible to attain the desired end.

Animal products (meat and wool) began to increase considerably in value in September, 1939, following on a gradual increase which had been taking place previously. This increase, added to the experience of the last war and the rise in the price of many imported products, caused the Government to issue a decree placing a tax of 25 per cent. on the difference between the price at that time and that of the annual average in 1937-38. The product of this tax was to be used solely for the purpose of reducing the price of articles of prime necessity.

The hope of a permanent rise in the price of animal products was not fulfilled, however. For this reason and for others of a different nature, the decree mentioned above was provisionally suspended.

In September, 1941, however, the considerable increase which had occurred in the price of animals for slaughter made it possible to apply the idea embodied in this decree. On September 3rd the Government issued a decree imposing a tax of about 3 per cent. on sales of livestock for slaughter. The product of this tax was to be used exclusively for the purpose of lowering the price of meat destined for consumption; the amount of the tax will vary in proportion to the increase in the sale price.

Summarizing the above, it may be said that the ideas which determined Government action as regards the regulation of prices, markets and foreign trade in agricultural products have remained unaltered. Minimum or fixed prices and other means adopted for assisting certain branches of agricultural production have been in force for many years. On the other hand, the control of rates of exchange which enables the Government to intervene in the price of agricultural products has been applied since the effects of the 1930 depression began to be felt. The only novelty in this respect consists in the tax on the increment in the prices of certain products as a result of the war and utilized for the reduction of prices on the home market. This idea had already been put into practice, however, in another form in connection with exchange control.

4. Policy in connection with agricultural production.

Evolution and encouragement. — In describing the evolution of agricultural production, emphasis should be laid on the huge area devoted to the cultivation of oleaginous crops for the manufacture of edible oils, the sunflower being of especial importance. The adoption of this policy dates from the Spanish civil war, as up till that time Spain had been the principal source of Uruguay's oil supplies. Upon the outbreak of the European conflict it became absolutely necessary to encourage this policy, and production reached its highest point in 1941 when the crop was sufficient to meet the requirements of industry, leaving at the same time a small surplus of oil for export. The areas sown to oilseed and the quantities harvested during the past few years were as follows:

Year	Sunflower		Groundnuts	
	Hectares	Tons	Hectares	Tons
1939	7,817	4,776	2,578	1,540
1940	41,651	23,034	3,512	2,670
1941 (approx.)	80,993	42,528	6,234	4,029

The introduction of these crops as a permanent part of agricultural production has proved extremely advantageous for farmers who have thus succeeded in adding new remunerative products to those already cultivated.

Flax, on the other hand, which is grown chiefly for export, is dependent on the fluctuations of the world market. Government intervention for the purpose of increasing the production of this crop began in 1932 with efficient propaganda, as it was found that flax exports brought in the currencies which were so necessary at that time. This policy was continued in varying measure until the 1939-40 crop, which proved difficult to place owing to the closing of the European markets which were the principal consumers of Uruguayan linseed. Owing to existing circumstances propaganda and encouragement in connection with this crop were interrupted and export bonuses were instituted instead. On the other hand, the United States of America, who up till then had not displayed much interest in linseed, increased their purchases of this product considerably. For all these reasons, the exportable production of the 1940-41 crop, as well as the surplus of the previous crop, was quickly sold and present prospects are quite favourable.

Among the most important changes as regards *animal production*, mention may be made of the discontinuance of exports of chilled meat, which have been almost entirely replaced by those of frozen and tinned meat, as well as of the huge demand for meat and wool already referred to.

5. Work of public and private organizations connected with agriculture.

The work of the various existing organizations has not changed to any considerable extent since 1939, as agricultural conditions in Uruguay have been affected more by climatic conditions than by the war. Among the public and private organizations which have had the greatest influence on agricultural labour, those which are most deserving of mention are the *Asociación Rural del Uruguay*, the *Federación Rural*, the *Comisión Nacional Pro-Fomento de Cultivos Industriales* (National Commission for the Encouragement of Industrial Crops), the *Comisión Nacional de Mejoramiento Ovino* (National Commission for the Improvement of Breeds of Sheep), the *Comisión de Fomento Rural* (Commission for the Encouragement of Agriculture) and many associations for encouragement situated in the various agricultural areas.

6. Co-operation.

Until a few months ago the co-operative movement in the country was confined to the existence of co-operative associations of consumers in the capital and a very few others connected with agriculture and stockbreeding in the country. After the coming into force of the system established by the law No. 10008, dated April 5, 1941, concerning agricultural and stockbreeding co-operative associations, however, such associations have increased in number. The Section for the registration, encouragement and inspection of co-operative associations has also been established and the associations already existing have been registered in this Section. The law referred to applies only to co-operative associations for agriculture and stockbreeding and it will soon be amended in order to extend its advantages to all forms of co-operative association. The decree containing the regulations contemplated by law No. 10008 provides for important activities for the encouragement and distribution of agricultural and stockbreeding co-operative associations and for propaganda in connection therewith, this work to be carried out by the Ministry of Stockbreeding and Agriculture. It also provides that this Ministry, through its technical staff, shall give every support and supply all necessary information to the associations already in existence, as well as to those established in the future. Among the co-operative associations established since 1939 the most interesting are the agricultural and stockbreeding co-operative associations such as: the *Cooperativa Ruralista Agropecuaria Limitada* (Montevideo), the *Cooperativa Agropecuaria Limitada de Tacuarembó* (Tacuarembó) and the *Unión de Productores Agrarios Limitada* (Montevideo). Other associations are in course of formation, such as the associations for the cultivation of citrus fruits, the *Cooperativa Citrícola de Cerro Largo* (Melo), the *Cooperativa Citrícola de Rivera* (Rivera) and the *Cooperativa Citrícola de San Gregorio*, as well as the agricultural and stockbreeding co-operative associations the *Cooperativa Agropecuaria de Colonia San Pedro* and the *Cooperativa Agropecuaria de Piedra Sola*

7. Agricultural credit.

The most important measures adopted since 1939 concerning agricultural credit are those connected with the law dated June 6, 1941, regarding seed loans. Under the terms of this law farmers who require them are given wheat, flax, sunflowers, groundnuts and oats for sowing during the current year. The total value of these loans must not exceed 300 pesos, to be repaid to the Government at a low rate of interest through the Republican Bank. The farmer having recourse to this form of credit for his wheat sowings is compelled to insure his crop against hail.

Over and above the usual forms of credit on wages, advances on the wool clip, credit for the purchase of animals for breeding, etc., mention may be made of an interesting form of credit now being studied. This is a credit for fencing which is intended to contribute towards a reduction of the average size of the sections in breeding establishments and thus to improve the technical arrangement of the farm.

8. Agricultural insurance.

The only important form of insurance existing in Uruguay is that against damage by hail, the regulations governing which have not undergone any important alteration during the past few years. The only change consists in the extension of this insurance to some crops, previously not covered by it. The insurance of breeding animals has been in force for a long time.

9. Social policy.

The most important problem in this connection is that of agricultural leases, a problem which has become more serious as a result of recent bad harvests. Parliament is at present studying a law contemplating the solution of this problem in a way satisfactory from the social point of view.

There is also a Commission entrusted with the study of the problem of rural housing and its improvement. The powers of this Commission have been extended during the past two years.

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[This volume, published under the auspices of the Italian Institute for the Middle and Far East, consists of four studies dealing respectively with the geography, history, political constitution, economy and communications of Thailand. It therefore offers a complete picture of the country in question, which interests us greatly, as it is essentially agricultural. One of the especial features of the land system of Thailand is the division of property into small allotments cultivated directly by the peasants. The chief crop and the chief export product is rice. During the past twenty-five years the area sown to rice has in fact more than doubled, increasing from 9,823,000 *rai* (1 *rai* = 1,600 sq. m.) in 1911-12 to 21,110,000 *rai* in 1935-36. However, the extensive development of single-crop cultivation of rice places the farmers at the mercy of seasonal fluctuations and of world market trends. This situation has had an enormous influence on the conditions ruling on small holdings. Agricultural indebtedness has increased to such an extent that the ownership of much land has fallen into the hands of usurers. Moreover, farmers do not sell their product directly, but through middlemen who absorb the greater part of the proceeds of the farmer's work. Irrigation is of great importance in connection with the production of the main crop. There is a close network of canals in the wide plains of central Thailand, the largest

of these being Rangsit, opened in 1896 and making possible the cultivation of rice over an area of 350,000 acres. The chief problem lies in the creation of a system of irrigation which would make the crop independent of seasonal changes and afford stability in annual production, thus improving the trade balance. Government efforts in this direction have been succesful. It is generally considered that the agriculture of the Thailand is capable of wider development, subject to the three following conditions: organization of markets for the sale of products, vocational training of farmers and development of agricultural credit. In its programme of the agricultural development of the country, the Government has given first place to measures for improving the quantity and quality of products. With this end in view, a survey has been carried out in order to ascertain which are the most suitable crops; experimental stations for agriculture and breeding have been established, seeds distributed and agricultural shows organized; gardening has been encouraged; some agricultural schools have been founded in the provinces and it has been decided to create a central school of agriculture. Included in the same programme are measures for encouraging the agricultural co-operative societies which originated in 1916 and which numbered 915 in 1938. It is generally recognized that the farmers in Thailand owed their ability to survive during the last period of depression to the financial aid they received from these co-operative societies, whose activities benefit not only their members, but the whole agricultural community.

The publication under review has the merit of drawing attention to a very interesting country, as yet insufficiently known, but offering notable possibilities of progress in various branches of its economic activity.]

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AGRICULTURAL ECONOMICS AND SOCIOLOGY

1942 No. 3

THE PROBLEM OF THE CONSOLIDATION OF AGRICULTURAL HOLDINGS IN EUROPE

by M. TCHERKINSKY.

I. — Introduction.

In speaking of the measures taken to remedy the evils caused by the excessive fragmentation of landed property, the consolidation of holdings must be placed in the front rank. As in the case of measures for preventing the excessive subdivision of rural property caused by inheritance laws, with which we dealt in our Bulletin of June 1941 (1), so again in the case of consolidation, the purpose is to remedy the drawbacks of further excessive fragmentation of the land, when the evil has already produced its effects. The end in view is the same in both cases; that of eliminating as far as possible the fragmentation of rural property, and contributing to the consolidation of an economically rational agrarian structure.

The phenomenon of fragmentation in the strict sense of the word, may occur in two different forms, either by the subdivision of a farming area into a number of excessively small holdings or farms, or by the division of farms into a great number of small scattered parcels of land. Statistics of landed property and of farms supply direct data on the first form of subdivision, but only indirect and very approximate data on the extent and importance of the second form. Thus, for instance, in France, the statistics for landed property would show that in the *département* of the Ardennes, where the average size of a holding amounts to 3 hectares, landed property is less broken up than in the Sarthe, where the average size is under 1 hectare. But these statistics do not tell us that the area given for the Ardennes is made up of thirty to forty scattered lots of land, whereas that of the Sarthe generally consists of one single lot.

(1) The evolution of the system of succession to landed property in Europe. *Monthly Bulletin of Agricultural Economics and Sociology.* June 1941, International Institute of Agriculture, Rome.

Either of these forms of fragmentation with its own characteristic features may occur independently of the other. It may also, at the present time, entail no special problem, as is the case in some countries, as for instance in England, where large and medium-sized agricultural holdings are the rule; in Norway, where the small farm is very common and where also the inheritance laws for rural property do not allow of excessive subdivision. Elsewhere, as in Switzerland, for instance, where small and medium-sized holdings predominate, in some parts of the country the fragmentation of the land in the farms is very marked. Generally speaking, these two forms of fragmentation go often together.

Each of these forms of fragmentation must be judged by their social and economic results. Thus the breaking-up of the agricultural area into a great number of small holdings assures a more equal division of the national wealth. But while the spread of small landed property, as long as it is not excessive, has many advantages from the social standpoint, it has great disadvantages if the fragmentation goes too far.

The second kind of subdivision, with which we deal here, may occur with estates of all sizes, but its harmful effects are most severely felt in the case of small peasant holdings.

II. — Causes of the excessive fragmentation of agricultural holdings.

Fragmentation is first of all the result of the system under which the land was first occupied and the villages organized; it is closely connected with the spread of the three field system. The purpose of this system, as is known, was to assure to each party thereto an area of like size and quality, situated as far as possible at a like distance from the farm. Whenever a change of ownership took place as the result of a sale, a marriage, etc., the several parts into which the farm was divided were almost always irrational from an economic point of view, and the distance between them increased.

In some regions a marked degree of pulverisation is generally the result of the division in kind of inherited holdings, each child receiving as far as possible a lot taken from each of the parcels of land. The number of parcels belonging to individual owners thus increases considerably as the generations succeed one another. Subdivision is less frequent in countries where there exists the rule of undivided succession to rural holdings. A marked degree of fragmentation is in many cases also the result of the unrestricted sale and purchase of land.

The extension of highways, railways and motor-roads which cut through fields in a haphazard way, also favours fragmentation.

III. — The drawbacks of excessive fragmentation.

The drawbacks of excessive fragmentation of the land, which is one of the most apparent causes of the economic weakeness of the farm, are generally well known. We will not here lay stress on the natural, legal, and social grounds which without justifying it from the economic standpoint account for the frag-

mentation of landed property; it can safely be said that excessive fragmentation makes it impossible to farm the land successfully and increases the costs to such an extent that the cultivation of the soil can no longer be profitable. The harmful results of the scattering of the lots of land make themselves felt in loss of time, in unproductive effort when tilling the fields or getting in the crops, to say nothing of the many roads and paths required for securing access to the several parcels, of the great amount of land which cannot be cultivated because used for landmarks or dividing ridges, etc.

One of the inevitable results of fragmentation and of the fact that the parcels of land are ensconced between other properties and cannot be directly connected with a road, is the impossibility of altering the customary rotation used in the district, even if it is admitted that another more rational system of cropping would be advantageous and would give higher yields. Thus the most prudent and capable farmer is dependent in all the working of his farm on the will of his slower and more routine loving neighbours (1).

All the parcels of land have to be cultivated at the same time, even if one of the owners has much more urgent need of carrying out other works. Thus for instance, in Belgium, as reported by Prof. DELOS to the International Congress of Rural Engineering held at Liège in August 1930, the discontinuity of the parcels of land is found most frequently in Flanders, Campine, Condroz, and Entre-Sambre-et-Messe, in the Ardennes and in the Jura districts, and there recourse must be had to compulsory rotations: the land has to be divided into three fields, corresponding to the triennial rotation, compelling all the owners to conform to this requirement.

Again in the Netherlands, according to Dr. FROST (2) it has been ascertained that 16 per cent. of the Dutch soil cannot be farmed rationally owing to fragmentation.

By increasing the number of ridges and landmarks, excessive fragmentation entails a considerable waste of agricultural land. Holdings whose length and width are in the ratio of 5 to 1 have the following length of ridges (3):

Size of the holding	Length of ridges Total	Per are
1 hectare	536.64 m.	5.36 m.
50 ares	379.44 »	7.58 »
10 »	169.70 »	16.97 »
5 »	120.00 »	24.00 »
1 are	53.66 »	53.66 »

The smaller the parcel of land, the greater the loss of area.

What we have said of the fragmentation of holdings holds good also for their dispersion, and their distance from the farm. Under such conditions not only is it more difficult to supervise the work, but often the cost of labour required for the cultivation is such as to absorb all the profits obtained from the farm.

(1) HOTTINGER, G.: Morcellement et remembrement. Paris, 1914, p. 2.
(2) FROST, Dr. J.: Die holländische Landwirtschaft. Ein Muster moderner Rationalisierung. Berlin, 1930, p. 68.
(3) LAUR, Prof. Dr. E.: Landwirtschaftliche Betriebslehre. Aarau, 1938, p. 124.

In Germany Dr. HESSE (1) has made a study of the matter. He has enquired into the influence of the growing average distance of the parcels of land from the farm on the cost of labour for each quarter of hectare in the various branches of farming. Here are the facts as regards cereal growing. Taking the distance in the cases studied (1600 metres) as 100 and supposing that 16 hrs. 30 min. are required, if the average distance be 500 meters the team hours required will only be 92,15 per cent.; for an average distance of 1,000 metres 95.71 per cent. and for a distance of 4,000 meters 117.67 per cent. For men the corresponding hours are 64.69, 98.40, and 110.03. On the basis of these figures the author shows the variations which the increase or decrease in the distance from the farm to the land may have on labour costs. An increase in distance is accompanied by a proportionately corresponding waste of time, increased expenditure on unproductive effort, and incidentally by an increase of working costs.

According to an official report for 1930 received by the International Institute of Agriculture, it is not unusual to find in the mountainous districts of Germany ten hectare holdings consisting of more than 100 scattered parcels of land. In such districts the average size of the parcels does not exceed 3 to 6 ares. To cultivate such holdings the peasants must go and come several times a day with their implements to the several places. This causes much loss of time, which might be put to better use. In the case of farms thus pulverised the labour costs are out of all proportion to the returns, and both labour and general working espenses are excessive.

On land broken up in such fragments intensive cultivation and the use of machinery is almost impossible and land improvements such as drainage, irrigation, the building of roads, etc., are much more difficult. Such lands may sometimes be farmed intensively from the technical standpoint, but they cannot be economically rationalized; or their cultivation is only apparently intensive, as the total costs per unit of area are much too high and cannot allow of a profit (2).

Another disadvantage of fragmentation is due to the fact that the property rights of the several owners of the lands thus divided into widely scattered tiny parcels, frequently cannot be ascertained with accuracy. Thus, according to M. BOURDIER (3), in Britany there are parcels of land of which no one is the recognised owner. In this respect, an inextricable confusion prevails in the minds of the people no less than on the land. Frequently the owners do not know the exact size or composition and lay of their inherited holdings. Under such conditions it is very difficult, indeed even impossible, to organize mortgage credit for the farmers, as an accurate knowledge of the location of the scattered and distant lots is lacking.

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(1) *Landarbeit* (Supplement of the *Deutsche Landwirtschaftliche Presse*), No. 12, 1925 and No. 1, 1926, Berlin, quoted in L'ORGANISATION SCIENTIFIQUE DU TRAVAIL AGRICOLE EN EUROPE. International Institute of Agriculture. Rome, 1931, pp. 113-114.

(2) STUDENSKY, Prof. G. A.: Intensität und Pseudointensität in der russischen Landwirtschaft. *Berichte über Landwirtschaft*, Nouvelle Suite, vol. VI, cahier 2, 1927.

(3) BOURDIER, L.: Le remembrement en Bretagne. *Revue des Agriculteurs de France*, No. 6, Paris, June 1939, p. 250.

The extremely small size of the parcels of land also frequently leads to the progressive urbanization of the rural population which is compelled to earn an additional income. According to the *Nationalsozialistische Landpost* of 2nd January 1941, in the Palatinate and the Saare, where 300,000 hectares, i. e. 75 per cent. of the cultivated area, are in need of consolidation, nearly 45,000 farmers i. e. 45 per cent. of the total number, are compelled to follow other trades and to look upon the farm as a source of subsidiary earnings, because the small holding with scattered parcels of land cannot provide them with an adequate livelihood. But as soon as the second trade requires more time, these owners are inevitably tempted to cease cultivating their lands. As the area cultivated by the mass of these people for whom farming is a subsidiary occupation, is considerable, the loss to the national economy is serious.

The general results of fragmentation are felt in the marked decline of land values. Thus M. CAZIOT [1] has noted in France in the case of the holdings in the calcareous lands of the Eastern planes, which are excessively subdivided, purchasers cannot be found for the more distant parcels of land. They are thrown in free to the purchasers of parcels more favourably located, or are sold at excessively low prices. In the canton of Juzennecourt (Haute Marne) a hectare of parcels of arable land at 4 kms distance from the village is sold at 0.75 to 1 fr. At sales parcels of land of 50 ares or more generally find purchasers, but lots of 10 to 20 ares can only be sold to people who are living near them. The fragmentation of the lands belonging to a holding reduces the value of farm capital proportionately to the number of parcels into which the holding is divided.

Fragmentation also affects the means used for farming, as the broken-up farms are generally worked by hand, and machinery can only be used in a few cases. It also affects the methods of farming, for as a result of the enforced division of the farm into scattered lots, the farmers are compelled to follow the crop rotation in general use; lastly, it affects the results obtained, which are low owing to fragmentation. All this, naturally, increases costs and hinders agricultural progress.

IV. — The juridical basis of the consolidation of holdings.

General remarks.

With a view to removing the serious obstacles which fragmentation places in the way of agricultural progress, an effort has long been made to consolidate the holdings with government help. The simplest way is that of exchanges by private agreement between the respective owners in a given locality, or by the voluntary collective restriping [2]. It is however very difficult to secure by

(1) CAZIOT, Pierre: La valeur de la terre en France. Paris 1914, p. 25.
(2) RICOL, Prof. M.: La réforme du partage successoral, See: *La Réforme Sociale*, Paris, 1921, May, 9th series, Vol. I., p. 291.

these means an agreement among the owners who want to have their holdings consolidated. In practical rural life the voluntary association formed by unanimous consent of the parties concerned for carrying out the consolidation of holdings is often almost impossible to secure. As Prof. RICOL (1) remarks: " By the voluntary exchange of parcels of land a landowner may reconstruct his property, but such means are only available in special cases, and cannot afford a real remedy for the evils of fragmentation. The only radical remedy, when once the fragmentation has occurred, are compulsory exchanges, subject to certain conditions, of the parcels contained within certain boundaries ".

Most European countries have now enacted special legislation, dating back partly to the beginning of the XIXth century and sometimes even earlier, for regulating the consolidation of holdings. Further on we shall deal in detail with the laws enacted in some countries and we shall then see to what extent they have contributed to relieving agriculture from the harmful consequences of the excessive fragmentation of holdings.

We have noted that in some countries—as, for instance, in England, Denmark, and Norway—the scattered parcels have already been consolidated and at the present time the problem of restriping no longer exists.

As far back as the middle-ages in England steps were taken to secure the consolidation of large estates at the time of the enclosures. The enclosure of the commons at the end of the XVIIIth century also led to the restriping of lands whenever such a measure secured the approval of two thirds of the owners. Consolidation became more and more frequent, and by the end of the first half of the XIXth century the agricultural holdings had been almost all consolidated. On the other hand, the inheritance laws of England, which favour the undivided transmission of estates, maintain the consolidated estates intact. Nearly all the estates are all in one piece.

In Denmark the amalgamation of landed property began with the enclosure of the commons carried out under a Royal decree on 1769, subsequently completed by the acts of 1781 and 1792, so that in 1835 only 1 per cent. of the total number of peasant holdings had not been consolidated (2).

In some other countries, as for instance Germany and Switzerland, much has already been done for the consolidation of holdings, but much still remains to be done.

In other countries, as in France, Italy, and some parts of Central Europe, the consolidation of holdings is still in its initial stage, although energetic efforts have already been made to control excessive fragmentation. This has been the case more especially in the countries of Eastern Europe at the time of the agrarian reforms which took place at the end of the first world war.

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(1) Restriping is the expression used in the legislative measures taken under the congested lands act in Ireland. It refers to the measures taken for consolidating into a single holding parcels of and belonging to the same person but often situated far apart from one another. The process entails exchanging lots between the several owners.

(2) VANDERVYNCT, Eugène: Le remembrement parmi les améliorations rurales. Paris, 1936, p. 323.

Germany.

Measures for securing the consolidation of holdings date back in Germany to the middle of the XVIth century. They were first carried out in Bavaria on the lands of the Kempten Abbey in the district of Allgau. In carrying out the consolidation not only were the several parcels of a single farm brought together, but even the farm-buildings were taken down and re-erected in the centre of the enclosed holding. Thus the village system was abolished and replaced by a system of isolated farms. This kind of consolidation was generally carried out in accordance with established custom and was based on the spontaneous consent of the peasants without any legal provision. As a rule a request made by two thirds of the members of the community was sufficient to enable the work of consolidation to be done.

During the XVIth and XVIIth centuries this kind of consolidation spread from Kempten to the whole district of Allgau, and to some parts of Eastern Upper Bavaria and Southern Wurtemburg. In Bavaria nearly 12,000 hectares were thus restriped. There are now nearly 900 isolated farms (*Einödshöfe*) which owe their existence to this kind of consolidation [1].

It was at the beginning of the XIXth century at the time of the great agrarian reform that land consolidation entered a new phase. In North Germany, and more especially in Prussia, the regulation of the relations between the landlords and the peasantry and the enclosure of the commons had been in many cases connected with the problem of the restriping of the parcels of land. It was only in the second half of the XIXth century that special laws on the consolidation of holdings were enacted. The most important from this point of view was the Prussian law of 1872. Under that Act and under others enacted in other parts of North Germany many holdings were consolidated prior to the war of 1914-18.

The consolidations carried out in South Germany were not compulsory and were not based upon a special law on restriping. In this connection the measures taken in the several regions in which division in kind was the custom, were important. They required that when a property had to be divided among the heirs or sold, parcels of land occupying less than a given area could not be broken up. The laws on the restriping of land (*Feldbereinigungsgesetze*) and other such exactments aimed almost exclusively at securing readier access to the lots by opening paths to facilitate the work of farming, without in any way modifying the mixing-up of the scattered lots belonging to different owners.

In Prussia land consolidation was reorganised by the decree of 21st September 1920 (*Umlegungsordnung*), which provided a uniform legal system for consolidation valid throughout Prussia. The excercise of the right enjoyed under the Act of 1872 to demand the consolidation of broken-up holdings has been con-

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(1) MÜNZINGER, Prof. Adolf, Flurbereinigung in Süddeutschland, ihre Geschichte and ihr Stand am 1. Januar 1935. *Berichte über Landwirtschaft*, Special numbers, new series, Berlin, 1936, p. 12.

siderably facilitated. The State was empowered to take the initiative for consolidation when the parties had not secured the required majority for starting proceedings. Should the President of the Land Improvement Office (*Landeskulturamt*) be of opinion that the conditions required for carrying out consolidation exist, he was empowered under the new decree to appoint a Commissioner to negotiate with the parties concerned. The President was required to do this on the request of the owners of one quarter of the holdings requiring consolidation. In fixing this proportion the size of the holdings and the net return of the land tax were taken into consideration. This provision which enabled the authorities to proceed to consolidation has since been inserted in the land consolidation legislation of Western and Southern Germany prior to 1935; in Bavaria this was done by a law of 1922; in the former Grand Duchy of Hesse by a law of 1923, etc.

The multivarious laws on land consolidation in the several German States —there were more than fifty, some being of very early date—no longer met the new needs of the country. They have been replaced by the Land consolidation Act of 26th June 1936 and the regulations of 16th June 1937. The Act and regulations contain uniform legal provisions for the whole territory of the Reich. They make it possible for administrative action to be taken throughout Germany for bringing about systematic land consolidation by simplified and rapid methods with a view, as stated in the preamble to the Act, better to insure the self-sufficiency of the German people as regards food and other supplies. Accordingly the carrying-out of consolidation does not any more depend on the agreement of the parties concerned.

The regulations of 16th June 1937 came into force on January 1, 1938. The leading features of the procedure are as follows:

A broken-up holding may be consolidated if this will enable the several owners to farm their land more efficiently or to improve the cultivation of the land. A holding of a shape which does not allow of its being used to economic advantage is treated as though it were broken up.

Consolidations are carried out by the competent authorities who are placed under the Superior Land Consolidation Officers.

The Reich Minister for Food and Agriculture is the official head of the Land Consolidation Services. He appoints the Superior Land Consolidation Officers and fixes their administrative districts, regardless of provincial frontiers. When the Superior Land Consolidation Officers consider that the preminary conditions required for carrying out restriping exist, he must hear the Chief of the Peasantry of the province and must explain to him the purpose of the consolidation.

If the Chief of the Peasantry of the Province agrees, the superior Land Consolidation Officers issue a decree ordering the consolidation and specifying the holdings to be restriped. The decree must state the reasons for the consolidation.

If the Chief of the Peasantry of the province does not give his consent, the decision rests with the Supreme Land Consolidation Authority after hearing the Chief of the Peasantry of the Reich.

The parties concerned form a public law corporation in virtue of the resolution authorizing the consolidation for protecting the interests of the parties concerned, subject to the supervision of the consolidation officers.

The said corporation may assess its members for contributions and advances, personal services and teams. The members make these contributions in proportion to the value of their new lands, unless the consolidation plan provides otherwise.

So as to assure to the parties lots of equal value to those they are giving in exchange, the *pro rata* value of each of the lots of the holdings subject to consolidation must be ascertained. In so far as the land values have been estimated for the parts of the holdings subject to amalgamation on the basis of the Act of 16th October 1934 regulating farm land valuations (*Bodenschätzungsgesetz*), these estimates will constitute the basis for fixing the *pro rata* values. In some cases exceptions to the land valuation rules are admitted.

In the case of farm land, the *pro rata* value is determined as a rule on the basis of the profit which each owner can secure by the normal use of the land, regardless of its distance from the farm or village. The accessory parts of a holding which permanently affect its value must be appraised separately.

In the case of buildings, their current value must be ascertained on the basis of the price for which they would sell under ordinary commercial conditions in the state in which they are, with due regard to all circumstances affecting the price; special or personal circumstances and changes of value due to the proposed consolidation are not to be taken into consideration.

The Land Consolidation officials restripe the land taking into consideration the general interest and in relation to the economic advantages derived from it by all the parties concerned. When the necessary reductions of area have been made (as provided by articles 51, 57, and 156) a piece of land of equal value to that taken away must be assigned to the holdings (land indemnity); in so doing all the circumstances affecting the income obtained from the land, its use and development must be taken into consideration, inclusive of the distance from the farm or village.

The new holdings must be suited to the same uses and possess the same qualities as the former holdings. Better quality must however be accepted as compensation for reduced area, and increased area as compensation for poorer quality, and lands suited to a certain use or having certain qualities of soil must, if necessary, be exchanged for other suited to another use or with a different kind of soil.

Any surplus land not required for compensating the parties to the consolidation proceedings is transfered to them as a body. The consolidation Officer, after hearing the Chief of the Peasantry of the province, decides the use to which the land shall be put. Any income obtained from its use is assigned to defray the expenses of soil improvement.

The area required for setting up plants or installations for common use must be provided without compensation by all the parties concerned, proportionately to the value of their former holdings, unless the land is occupied by plants of a like description erected prior to the restriping or unless the necessary space

is provided by a surplus area resulting from the remeasurement of the area subject to consolidation, or given by one or other of the parties to the proceedings. Any deficiency in the total area resulting from the remeasurement of the zone must be made good in like manner.

Should compensation in land not be possible, or should it be incompatible with the purposes of the consolidation, compensation may be given in cash. In the case of hereditary peasant holdings (*Erbhöfe*) compensation must always be made in land to the extent to which compensation in cash might compromise the economic vitality of the farm.

As to the costs of consolidation, the administrative expenses connected with consolidation authorities of the first and second instance are met by the provinces where they have their seat, while those of the Supreme Land Consolidation Authority are met by the Reich The parties to the consolidation are required to reimburse the province for the cost of carrying out the consolidation at the rate of 25 R.M. per hectare of land restriped; this contribution may be reduced to 5 R.M. or raised to 125 R.M. according to the fertility of the soil and the economic conditions of the parties concerned. Costs generally vary from a minimum of 200 to a maximum of 400 R.M. per hectare, depending on the configuration of the holdings, the nature of the soil, the degree of fragmentation etc.

In the case of new works of value to all the owners, such as roads, ditches, etc. and works of public interest such as motor-roads, the parties concerned are required to surrender quotas of land as follows: (1) not to exceed 7 1/2 per cent. of their rights of participation to cover the cost of the works and (2) as compensation for land improvements on their holdings.

The areas thus obtained will be used for assuring a sound distribution of the land by assigning them mainly for purposes of internal colonization. Such surrender of land must not be permitted to compromise the economic vitality of hereditary peasant holdings.

Summing up, the main provisions of the law are as follows: Land consolidation proceedings can only be started by an official decision. As soon as the consolidation had been decided, the parties concerned form a public law corporation. The costs may be covered to a large extent by the surrender of lands. This is of financial assistance to the parties concerned, especially in securing credit on behalf of hereditary peasant holdings. Henceforth all the necessary land improvements will be made at the time of the consolidation.

France.

The distribution of landed property in France is comparatively well balanced, but there is much to be done in the matter of the consolidation of holdings. In some parts of the country the loss of yield caused by excessive fragmentation of the holdings is estimated at 30 %. A very considerable area in France is occupied by parcels of land of less than 10 ares which it is increasingly difficult to cultivate.

The agricultural census of 1929, gave for the first time an approximate estimate of conditions as regards the fragmentation of holdings in each *département*. The phenomenon is especially pronounced in the following seven regions: North, 17 per cent. of the cultivated area, a figure which, according to M. AUGÉ-LARIBÉ, appears to be somewhat below the mark; East, 51.2 per cent. a percentage which is probably too high, although that part of the country has long suffered from excessive fragmentation of land; Centre, 30.6 per cent.; *Massif Central* 19.5 per cent.; South-West, 16.6 per cent.; West 24.7 per cent.; South and South-East, 36.3 per cent. Thus, 28 per cent. of the total cultivated area of France is occupied by excessively broken-up holdings (1).

Public opinion, however, did not attach much importance to the matter until after the war of 1914-18. Indeed, when in 1891, in connection with an enquiry made by the Extra-Parliamentary Commission on the Land Register, a questionnaire was sent to the several Departments asking if the consolidation of holdings and the opening of rural roads would be well received, and if these measures would be of real value to the regions concerned, the replies were as a rule unfavorable. The authority and value of such replies has indeed been questioned. Nevertheless the utility of consolidation was recognized and the formation of syndicates for facilitating such operations was accepted by nearly one third of the *départements*. In 1908 the Ministry of Agriculture made an inquiry into the conditions of small holdings in France, and the replies received to the questionnaires then sent out, show much the same ratio.

In any case the consolidation of holdings continued to be a regional problem in France, confined mainly to the Lorraine, where it was first undertaken in 1770 at Neuvillers-sur-Moselle. But the example there given continued to be an isolated case until the second half of the following century, and even later, and the consolidation of holdings was only carried out occasionally.

When the French Revolution freed agriculture from the legal and economic impediments of the past, it did nothing to check the excessive fragmentation of land by legislative measures encouraging consolidation. Nevertheless, since 1865 it has been possible, under the provisions of the Act of 1865-1888 on syndical associations of landowners, to form syndicates for the consolidation of holdings. Apart from providing for the opening and upkeep of farm roads, this Act did not, however, expressly provide for consolidation. It merely enabled the majority of the landowners organised in an association to compel the minority to accept the decisions taken for carrying out some works of general advantage such as drainage or irrigation works, and the consolidation of holdings could be included under this heading.

The collective restriping and the compulsory exchange of parcels of land required by the Act have, generally speaking, met in France with strenuous opposition based on the defence of property rights. Sometimes, indeed, compulsory exchanges imposed upon an unwilling minority were construed as forc-

(1) AUGÉ-LARIBÉ, Michel: Structure agricole. *Revue d'économie politique*, Paris, January-February. 1939, No. 1, pp. 126-127.

ible acts of medical intervention. " We are rather inclined—says M. CHAUVEAU [1]— to compare them to a surgical operation the need of which may arouse anxiety on the part of the patient, but for which he is grateful when the results make themselves felt ".

The consolidation of holdings in France is regulated by two different sets of legislative enactments, one referring to the districts devastated by the war of 1914-18, and the other dealing with the other parts of the country.

Such matters are regulated for France as a whole by the Acts of 27th November 1918, 30th October 1935, and 9th March 1941. The Act of 4th March 1919 provided a special system for the devastated districts.

The Chauveau Act of 27th November 1918 enables farmers to form syndical associations under the provisions of the Act of 21st June 1865-22nd December 1888 for carrying out the consolidation of holdings and the land improvements connected therewith. These registered associations must secure the approval of the majority of the parties concerned as represented by two thirds of the votes and more than half of the area under consideration. The minority must then either accept the exchange of parcels of land or else part with their holdings. The Act of 1918 thus lays down the principle that a majority of landowners who favour consolidation of holdings can compel the minority to accept it.

Under the provisions of the Act of 1918 the exchanges to which collective restriping gives rise, aim at securing to each owner an area proportionately equivalent in size and quality to the lands he possessed within the boundaries of the area covered by the proceedings.

In exceptional cases compensation in cash is admitted.

Under this Act and under the Act of 1935 the initiative in favour of consolidation and the execution of the work is always left to the parties concerned, whereas the Act of 4th March 1919 for the devastated districts assigns this initiative to the Prefect, whose duty it is to investigate the territories where the boundaries of the parcels of land have disappeared or are indistinguishable and to issue an order for the restriping of the holdings, which is carried out by official action.

The purpose of the new allocation is that of assigning to each owner, as the result of consolidation proceedings, account being taken of the different kinds of crops raised, of the area as shown in the land-register and of the appraisement of unbuilt property made under the provisions of the Act of 27th May 1918, an area of a value proportionately equivalent to that of the lands he previously owned in the area subject to consolidation.

The Government compensation for damages to unbuilt property subject to realottment is divided between the owners in proportion to the loss of taxable income which each of them has incurred.

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[1] CHAUVEAU, Dr. C., Sénateur de la Côte-d'Or: Le remembrement et la propriété rurale, Paris, 1918, pp. 28-29.

The Act of 4th March 1919 was a temporary measure, enacted as already stated for the devastated areas. The cost of the operations was met in full by the Government as reparation for war losses. The consolidation of holdings was considered by this Act as a work of public utility.

The legal basis for the consolidation of scattered parcels of land is now afforded by the Decree law of 30th October 1935, supplemented and amended by the Act of 9th March 1941.

Under the provisions of art. 2 of the Act of 1935, exchanges arising from the collective restriping of lands are made in kind. The purpose is to assign to each owner an area proportionately equivalent in fertility to that of the lands he owned within the boundaries of the area subject to consolidation proceedings taking into account local conditions and deducting the area required for collective works.

Art. 2 of the Act of 1935 replaces the expression « area both as regards extent and quality » of art. 2 of the Act of 1918, by words conveying the idea of the productivity value of the soil, i. e., its potential yield, a concept which was not specified in the Act of 1918. The expression adopted in the Act of 1918 might indeed, as M. DAMUZEAUX truly remarks, give rise to different interpretations of the meaning of " value " [1]. Value could indeed be understood as referring to classification in the land-register, but this valuation serves only for the purpose of assessing the land-tax. Or it might be understood as referring to the rental value, which evidently varies with circumstances, or again as referring to the market value which depends on supply and demand, distance from the farm centre, difficulty or facility of access, etc. Whereas here, obviously, it is the value for productive purposes which is meant.

As regards the further fragmentation of the consolidated holdings, article 6 of the decree-law of 30th October 1935 contains the following provision: " In case of the further division of consolidated holding, facilities of access must be maintained or provided to each of the parts equivalent to those provided for the holding which is being divided, as a whole. All dispositions to the contrary are null and void ".

This article only deals with the facilities for access to the parcels of land. Each parcel must have access to the public road. But, as noted in our Bulletin of June 1941 (p. 182), the Decree of 17th June, 1938 inserts into the amended French Civil Code a clause allowing, under certain clearly defined conditions, the maintenance of obligatory prolonged joint possession of holdings or its assignement in full to one of the claimants. Moreover, the Act of 9th March 1941 specifies that, with a view to avoiding the futher subdivision of farms which have been consolidated or formed independently of the requirements of the Act of 16th November 1940 on real estate transactions, any division of parcels of land included within the boundaries of a consolidated area, can only be made with the consent of the Departmental Commission for Land Reconstruction.

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[1] Le remembrement. See: *L'Agriculture pratique*. Paris, No. 16, 1937, p. 548.

In those cases in which the consolidation of holdings is important and affects at least either half of the total area, of half of the total number of parcels of land, and if it relates to a district for which the land-register has not been changed under the régime introduced by the Act of 1850 or by later laws, the district land register may be revised at the expense of the Government at the same time as the consolidation is carried out. It is obvious that by this means the full practical results of both operations can be obtained and absolute security of property rights on the holdings and of a fair assessment of the taxes can be assured.

The initiative in the formation of a syndical association for the consolidation of holdings is taken under the provisions of the Act of 1935, either by a group of land-owners, or by municipal council which applies to the Ministry of Agriculture for the free assistance of the rural engineering services in forming the Association. The general meeting of the landowners draws up the final articles of association. If the majority required by the Act is secured—i. e. the approval of half of the landowners owning two thirds of the area to be restriped, or two thirds of the landowners owning half the area—the Prefect issues an order recognising the Association.

To afford the fullest possible guarantees to the landowners in the consolidation proceedings, the Act provides for a special court known as the Arbitration Commission, appointed by a decree of the Prefect.

Under the Act of 19th March, 1941, the syndical associations of landowners authorized to proceed with the consolidation of holdings, which have been slow in constituting themselves, have been replaced by a communal Commission for the restriping and consolidation of holdings, set up under a decree of the Prefect in each commune at the request of the parties concerned or of the public authorities. Thus the authorities are enabled to enforce compliance with their decisions. At the same time the several arbitration commissions under the Act of 1935, which were to be set up for each operation, have been replaced by a single Departmental Commission qualified to settle without appeal all disputes arising from the consolidation proceedings. It can decide on the compulsory restriping in zones where the need is felt.

The Communal Commission proposes to the Prefect the best use for lands abandoned or uncultivated for more than two years. It can propose that they be grouped so as to form lots of a size suited to peasant family farms, as far as possible all in one piece according to each kind of crop. The land parcels composing such lots are expropriated.

The lots formed under the provisions of this Act are sold or granted preferably to inhabitants of the commune or the communes concerned. In case of sale the purchaser must undertake to erect on the property the necessary farm buildings; he may obtain a subsidy not exceeding half of the building costs. When the lots are leased, the Government meets the cost of the buildings. The farmer may become the owner of the lot leased.

As regards the restriping of arable lands this Act provides that no lot may be assigned which is more than 3 kilometres from the centre of the farm of the

assignee; lands which are more than 3 kilometres from the farm buildings, and which have not been assigned, will be incorporated with those which are to become peasant family farms or are to be rewooded [1].

The views embodied in this Act are therefore reminiscent of those embodied in the executive Act of 1919 which was more effective than those of 1918 and 1935.

Italy.

In Italy legislative measures for the consolidation of holdings are of quite recent date. The Royal Decree of 13th February 1933, which makes new provisions regulating integral land reclamation, lays down certain rules for the consolidation of holdings in the land reclamation zones. It provides *inter alia* that when the parcels of land are consolidated each owner receives in exchange for his lands a single lot, or several lots, if that should better answer the purposes of the reclamation works.

Any benefits or losses caused to the owners of land by the addition or subtraction of productive area due to consolidation must be in proportion to the original value of their respective holdings.

As the consolidation of holdings is of importance for national production, the Book on Property of the Civil Code, which came into force on October 28, 1941, extends the legislation thereon to the whole of Italy. The matter is substantially regulated as follows:

When several contiguous parcels of land of a size below that of the minimum cultural unit, belong to several owners, a consortium of the said owners may be formed at the request of one of the parties or at the instance of the administrative officers, with a view to their consolidation, which will allow of a better use of the said lands.

The rules regulating land-reclamation consortia formed by the landowners concerned, hold good for the consolidation consortia as well. They may take over the upkeep and execution of the other works of common interest to several holdings, or of special importance for one of them. The consortia are set up by Royal Decree; when the initiative for their formation is not taken by the parties concerned, they may be formed by the authorities concerned. They are recognized as legal persons and their activities are regulated by the rules laid down in the special Act regarding them.

To assure a better configuration of the holdings, expropriations and compulsory exchanges may be ordered; the boundaries of the holdings may also be rectified and they may be rounded out.

Compulsory transfers are not applicable to: (1) parcels of land on which the owner or the farmer have a dwelling house; (2) lands bordering on buildings or which are annexed thereto; (3) building lots; (4) orchards, gardens and parks;

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(1) CAZIOT, Pierre: La loi du 9 mars 1941 sur la réorganisation de la propriété foncière et le reboisement. See: *Le Progrès agricole et viticole*, No. 20, Montpellier, 18 May, 1941, p. 348.

(5) lands required as sites for industrial or commercial establishments or their warehouses, etc.

At the time of the compulsory transfers, legal encumbrances on the land are repealed, maintained, or created as the new arrangement of the holdings may require.

The enjoyment of other real rights is transferred to the lands allotted in exchange, and when they were not enjoyed by all the lands belonging to a given owner they are transferred to the new holding allotted him in proportion to the value of the lands on which they existed. In cases of forced expropriation of real property part of which has been mortgaged the whole of the property is expropriated, and the holder of the mortgage is entitled, according to rank, to a share in the price corresponding to the portion of the property on which the mortgage has been taken.

It is presumable that this important legislation will have a marked effect on the future development of the consolidation of holdings in Italy.

The Netherlands.

In the Netherlands, the fragmentation of holdings has assumed considerable proportions in certain districts. In some localities the consolidation of agricultural holdings has, indeed, become an urgent necessity.

Under the provisions of the Act of 20th May, 1938 consolidation is carried out under agreements (*overeenkomst*) or under a law for the promotion of agriculture, horticulture, sylviculture, and stock-breeding and for the development of peat-lands.

On signing a consolidation agreement, three or more persons enter into a written undertaking to consolidate the holdings specifically mentioned and entered as their property in the landregister, to reallot the area thus constituted, and to divide it among themselves in the manner laid down in the agreement.

Consolidation under the provisions of the Act must be requested (1) by not less than one fifth of the owners entered as such in the landregister (the Act of 1924 required that the request be made by one quarter); (2) or else by agricultural associations or legal persons.

Article 34 of the Act provides that the approval of a resolution for consolidation requires the consent either of the majority of the owners entered as such in the land register, or of those entered as owning a land register area amounting to more than half of the area comprised in the central block.

If the resolution to start consolidation proceedings has not been agreed upon, but the consolidation is imperative for reasons of public interest, and *if the assent of at least one half of the majority fixed by clause 34 has been obtained*, the Minister responsible for agricultural affairs is empowered, on the instance of the Central Commission, to order the carrying-out of the consolidation, just as if the necessary resolution had been agreed upon (cl. 36).

By the decree-law of the Secretary General for Agriculture and Fisheries of 19 July 1941, the words printed above in italics have been suppressed, and

consolidation can accordingly be carried out by order, without the majority's agreement required under the law of 1938 being obtained.

Each owner is entitled to secure ownership, an " opstal " (right to build, to carry out works, etc.) a perpetual lease (emphyteusis), or usufruct for working or for using as a dwelling place, of lots of a value which, compared to the total value of all the lots, assures him the same ratio which the value of the holdings he owned and which have been consolidated, had to the value of all the holdings included in the area covered by the proceedings.

Exceptions to this rule are allowed only in cases when its application would prevent satisfactory restriping.

Any difference in value will be reimbursed to the owner or will be paid by him in cash. Unless the consent of the owner of the property or of the mortgagee is obtained, this difference may not exceed five per cent. of the value of the land which the owner is entitled to obtain under the provisions of the Act.

The Central Commission, which has the general direction of the consolidation proceedings, may be empowered by the Government to come to a written agreement with the owner with a view to reducing the value of the lots to which he is entitled by an amount equivalent to that part of the cost of restriping which, in the opinion of the Central Commission, would probably be his share thereof, or to a part of such cost.

In so far as it does not adversely affect the restriping, each owner will be assigned lands of the same quality and suited to the same purposes as those which he owned and which have been included in the consolidation, and they shall consist preferably, in all or in part, of those same lands.

The costs incurred for the Central Commission, for the help given by the land registry, for the convocation and holding of the meetings, for public notices, and the expenses incurred in cases when the consolidation is not proceeded with, are met by the Government. The Treasury makes advances for all the other costs. The cost of carrying out the consolidation is distributed among the lots proportionately to the value assigned them.

On the lots assigned to the several owners the Government levies a " consolidation rent " at the rate of 5 per cent. of the amount due under art. 89 of the Act. This rent is payable for a period of 30 years as from the year following that during which the consolidation rent was entered in the land register.

Portugal.

Under the provisions of the Act for the consolidation of holdings of 10th May 1919, the operations must be extended, in so far as possible, to an area bounded by fixed and natural boundaries. They may not affect an area of more than 300 hectares.

The restriping of an area of land is made compulsory only when at least two thirds of the respective owners of the holdings, representing two thirds of the lands to be restriped, approve of the proceedings, which must be authorised by the Minister of Agriculture.

In planning the reallottment of the holdings or of new parcels of land, an endeavour must be made to abolish encumbrances, do away with enclaves, and facilitate a better agricultural use of the several lots in conformity with topographical and agricultural conditions and with the means of which the owners dispose.

Each owner obtains land of approximately the same value as that previously held, consisting as far as possible of parcels of land suited to the same crops, situated as far as possible at a moderate distance from the former parcels, of a shape which will facilitate the working of the farm and provided with easy and permanent means of access.

An effort must be made to avoid cash payments for additional assignments of land.

The owners of the consolidated holdings are exonerated from the payment of the land-tax for a period of three years from the date on which their holdings were restriped.

The salaries and allowances due to the delegates of the Physiographical Services are met exclusively by the Government. The other costs connected with the consolidation are divided among the several owners, proportionately to the number and values of their holdings, unless a special agreement of the parties concerned regulates the matter otherwise.

Switzerland.

The Federal orders issued in 1884 and 1893 and other more recent measures have been taken in Switzerland in favour of the consolidation of holdings. Article 9 of the Federal Act of 22nd December 1893 on agricultural improvements provides that the Confederation will, under certain conditions, subsidise works undertaken for improving the soil and promoting agricultural development.

On the other hand, article 703 of the Swiss Civil Code of 1912 greatly facilitates consolidation by providing that it may be made compulsory in those cases in which it is requested by two thirds of the owners concerned holding more than one half of the lands to be restriped. In such cases the minority is required to accept the decision of the majority. The Cantons are empowered to mitigate the conditions required by the Civil Code for the organisation of works for the consolidation of scattered parcels of land.

An order of the Federal Council of 23rd March, 1918 which tends to encourage the consolidation of scattered parcels of land has also had satisfactory results. The order requires that the consolidation be carried out before the land register is compiled. It also provides that the federal subsidy granted for such consolidations be increased in each particular case by at least the amount the Confederation will save as a result of being able to make the land surveys for the register on consolidated holdings. This increase varies as a rule between 5 per cent. and 20 per cent. of the costs of consolidation.

Under the Federal order of 11th February, 1941 which aims at securing special land improvements for the purpose of increasing the production of food

crops, the general assembly of the owners of lands to be consolidated may decide by a majority of those owning more than half the area concerned, that the redistribution of the lands be deferred until the end of the war time economic emergency. In exceptional cases, the Federal Office for Land Improvements or the cantonal government concerned, may also require that the redistribution be deferred.

When consolidation takes place at the time of making the survey for the land register, the Confederation generally meets the costs in a ratio not exceeding 50 per cent. As nearly 40 per cent. of the costs are met by the Cantons, the share met by the farmers does not exceed 10 per cent.

* * *

The legislative measures taken in the several countries for the consolidation of holdings have led to a characteristic evolution of the social aspects of the work and of the measure in which the parties concerned are required to collaborate in carrying it out.

Formerly consolidation could only be carried out with the unanimous consent of all concerned, the purpose being to avoid, as far as possible, any interference with property rights. But, as we have seen, such unanimous consent was difficult to secure, and therefore the results obtained were very limited.

Later on the work could be undertaken if a given majority of the parties concerned were in favour of consolidation and the minority was required to collaborate. In ascertaining the majority account had to be taken both of the personal vote and of the real position — area of the holding or tax payment — of each of the parties or else with a view to preventing the small farmers from being outvoted by the owners of large holdings, the majority was ascertained on the basis of a combination of personal votes and property votes.

Former legislation generally required a very considerable majority in favour of consolidation before the work could be undertaken, even in cases when public interest was involved. But as the advantageous results of the amalgamation of holdings have become more and more apparent, and as the national importance of such operations has been realized, the majority required by the legislation of the several countries has been reduced.

Gradually, as the influence of the private interests of the parties concerned diminished, the part played by the State in consolidation proceedings increased in importance in conformity with modern views on the social character of landed property. A stage has thus been reached when the consolidation of holdings no longer depends on a request made by the parties concerned, but when it is decreed by the State and carried out by authority.

V. — The consolidation of holdings in practice.

The importance of the consolidation of holdings as a means for eliminating enclaves (portions of a holding entirely surrounded by lands belonging to other owners and therefore difficult of access) is thus generally recognised and in some countries restriping has already secured tangible results. If the number

of these countries is limited, still fewer are those which can supply us with information on the subject. If, however, the material available is used merely for illustrating what has been done under the different conditions, it may prove sufficient and may perhaps induce other countries, where this form of land improvement is still in its initial stages, to take steps to promote the consolidation of holdings.

Germany.

In the Reich within its former boundaries the area in need of consolidation is estimated at over 6 million hectares, half of which are in Prussia; it extends to 1 million hectares in the East March (former Austria). As the total agricultural area of Greater Germany amounts to 31 million hectares, the 7 million in need of restriping account for nearly one quarter of the whole.

For reasons already stated, the conditions as regards the consolidation of holdings differ widely in the various parts of Germany. In the northern and eastern parts of the Reich fragmentation has already been largely eliminated by restriping, but in the South and West large areas still consist of scattered holdings. This is the case in Bavaria, in Wurtemberg, in the former Grand Duchy of Baden, in the Rhineland, etc. Thus in the former Grand Duchy of Baden there are 4.6 million parcels of land; a 3 hectare farm consists on the average of 16 parcels of land. Similar conditions are found in Wurtemberg, in the province of Hohenzollern, and in the former Grand Duchy of Hesse.

Data on the scale of consolidation operations are available for Prussia since 1874. As prior to that date consolidation was carried out at the same time as the division of the lands of the landowners from those of the peasantry and the enclosure of the commons, separate statistics for restriping were not published. But even the more recent statistics on the consolidation of holdings carried out in the Reich often give only approximate figures, as has been shown by Professor Münzinger; moreover those given by the several writers on the subject differ. Thus Hoster gives the area requiring restriping in the former Grand Duchy of Baden as 550,000 hectares, whereas Henkelmann places it at 270,000 hectares. This is due chiefly to the fact that prior to 1937 consolidation statistics were decentralized and based mainly on the estimates of the land improvement offices. Only since 1937 are the statistics on consolidation prepared by the Reich Statistical Service on the basis of information supplied by the authorities responsible for consolidation. Their purpose is to note the changes which have occurred in landed property and which have made it necessary to carry out the consolidation of holdings and other measures for land improvement [1].

Prior to the war of 1914-18, 50 to 60 thousand hectares of land were restriped annually in Prussia, more especially in the western provinces such as the Rhineland, Westphalia, Hesse-Nassau, but also in the province of Saxe

(1) DIE STATISTIK IN DEUTSCHLAND NACH IHREM HEUTIGEN STAND, herausgegeben von Friederich Burgdörfer. Berlin, 1940, p. 859.

and to some extent in that of Hanover. The Rhineland is the part of Prussia where the fragmentation of holdings has been carried to an extreme; nearly 25 per cent. of the whole German area in need of consolidation is found in that province, where at the time of the enclosure of the commons in Prussia (Edict of 1st September 1811) Rhineland law was in force for 90 per cent. of the total area of the province. Feudal estates had already been abolished by the French legislation, but their abolition had not been accompanied by the restriping of the holdings. In this region, in which Rhineland law was in force, consolidation was carried out only much later, in virtue of the law of 24 May, 1885 (1).

In Bavaria the fragmentation of holdings is very common in the Palatinate, where very small and small farms account for 75.7 per cent. of all farms, and in Lower Franconia, where their ratio stands at 57.9 per cent. In those districts the free division of landed property was in force, being very common in the Palatinate and preponderant in Lower Franconia. In other parts of Bavaria landed property was generally transmitted in full to the principal heir.

Considered from the standpoint of inheritance systems, Wurtemberg falls into three districts more or less clearly differentiated. In the district where the division of land in kind was practised the average size of the separate parcels did not exceed an average of 20 ares (2).

The former Grand Duchy of Baden also fell into three districts. One, where the undivided inheritance of land prevailed, was situated in the mountainous and isolated territories of the Black Forest and the Odenwald; division in kind was practiced more especially in the plains of the Rhine, in the other parts of the Duchy both systems of inheritance were in use.

In these three States the following areas have been restriped during the periods indicated below (in hectares):

Period	Bavaria	Wurtemberg	Former Grand Duchy of Baden
1870-1880	—	—	35,580
1881-1890	(3) 1,823	1,292	19,600
1891-1900	19,804	25,199	14,400
1901-1910	48,563	20,768	11,670
1911-1920	38,078	40,882	3,410
1921-1930	84,003	66,349	4,620
1931-1934	130,868	31,679	4,818

The number of hectares on which the consolidation of holdings has been carried out is therefore largest in Bavaria, but the ratio of restriped to total holdings was lower there than in Wurtemberg and in the former Grand Duchy of Baden. According to rough estimates the restriped area accounted in 1930 for 30 per cent. of the total agricultural area of Bavaria, but for only 8 per

(1) SPERBER, Dr. Karl: Stand und Entwicklung der wirtschaftlichen Umlegung der Grundstücke in der Rheinprovinz. *Berichte über Landwirtschaft*, New series, special booklets, Berlin, 1936 p. 51.

(2) MÜNZINGER, Prof. Adolf: Der Arbeitsertrag der bäuerlichen Familienwirtschaft. Berlin, 1929, Vol. II, p. 27.

(3) For 1888 and 1889 only.

cent. of the total area requiring restriping. The respective figures were 14 per cent. and 17 per cent. for the Grand Duchy of Baden and 20 per cent. and 31 per cent. for Wurtemberg (1).

In the former Kingdom of Saxony no less than 360,000 hectares of land, or 40 per cent. of the total agricultural area, were in need of consolidation. According to Professor Sering, the work had been carried out on 211,000 hectares by the end of 1930. Land conditions in Saxony are generally speaking more favourable than elsewhere to the consolidation of holdings; yet many are still suffering from excessive fragmentation. There, as elsewhere, this is due to the fact that the law regulating the right to demand consolidation did not favour initiatives in this direction and that the action of the Government in their favour was rather limited.

The pace at which restriping has been taking place in Germany in the last few years is illustrated by the following data: from 1933 to 1940 inclusive, 778,300 hectares have been restriped, and during the last four years, since the publication of the order on consolidation, the figures have been as follows: 105,100 hectares in 1937, 125,331 hectares in 1938, 106,000 hectares in 1939, 72,300 in 1940. As a result of the war the number of consolidations undertaken fell by nearly 13 per cent. in 1939 as compared to 1938, the area restriped by 20 per cent. and the number of consolidated holdings by 29 per cent. (2). For the Reich in its former frontiers as a whole the reduction from 1939 to 1940 has been 39 per cent. for the number of consolidation proceedings undertaken, 45 per cent. for the area restriped, and 38 per cent. for the number of holdings consolidated (3).

It is in the West and South West of Germany, where medium-sized and small peasant holdings are the rule, that now as formerly the ratio of holdings

Regions where the greatest number of consolidations has been carried out in the four years 1937 to 1940.

Year	Wurtemberg		Bavaria		Rhineland		Hesse		Hesse-Nassau		Westphalia	
	No. of consolidations	area restriped hectares	No. of consolidations	area restriped hectares	No. of consolidations	area restriped hectares	No. of consolidations	area restriped hectares	No. of consolidations	area restriped hectares	No. of consolidations	area restriped hectares
1937	77	8,100	42	15,400	33	23,500	32	16,000	27	15,000	10	10,500
1938	73	8,400	43	16,000	38	28,000	33	24,500	24	16,000	8	7,000
1939	84	9,300	38	19,000	22	17,000	20	16,450	22	10,400	8	9,600
1940	43	4,347	28	12,133	24	17,761	7	4,411	21	11,057	8	6,928

(1) DECK, Helmut: Die Entwicklung der Grundstückzusammenlegung seit der Stein-Hardenbergschen Reform. Bleicherode am Harz, 1939, p. 55.
(2) *Vierteljahrshefte zur Statistik des deutschen Reiches.* Berlin, 1940, 49th year, 3rd number.
(3) *Vierteljahrshefte*, Berlin, 1941, 50th year, 3rd number.

and area restriped is the highest. This is shown by the following table which brings together the figures for the period 1937-1940, for some of the regions most important from the standpoint of consolidation.

During the four years under consideration the largest number of consolidations took place in Wurtemberg, followed by Bavaria, the Rhineland, Hasse, which in 1940 came last, Hesse-Nassau, and lastly Westphalia.

As regards the area restriped, the Rhineland still ranks first; only in 1939 did Bavaria exceed it by a small margin (17,000 ha against 19,000). The area restriped was smallest in Wurtemberg, indeed, except in 1938 it was less than the area restriped in Westphalia, although the number of consolidations carried out was lowest in that province. This state of affairs shows that small peasant holdings have not the same importance in the several regions, and that fragmentation is greatest in Wurtemberg.

With the exception of the province of Hanover where 4,340 hctares were restriped in 1940, only consolidations of less importance, if any, were carried out in the Reich during that year. In the whole of the Reich, 42,300 holdings were consolidated their average area being 1.7 ha. In Prussia the average area rose to 2 ha, in Wurtemberg it fell to 0.6 ha, and in the former Grand Duchy of Baden to 0.4 ha.

As to the thoroughness of the work of consolidation, the ratio between the number of holdings within the boundaries of the consolidated areas before and after retriping fluctuated for the Reich as a whole during the last four years between 2.3 : 1 (1937) and 2.5 : 1 (1940); in 1940 the number of parcels of land fell after the consolidation had been carried out from 272,000 to 107,000, or by 61 %. As compared to the average for the whole Reich, which stood in 1940 at 2.5 : 1, the degree of intensity was highest in the Rhineland, where the ratio of the number of lots before and after consolidation stood at 3.8 : 1. Pomerania followed with a ratio of 3.2 : 1, and Wurtemberg again came last with a ratio of 1.3 : 1. This very low ratio is accounted for by the fact that in Wurtemberg consolidation was aimed primarily at securing paths for access to the holdings in the districts under vineyards and orchards.

The total cost of restriping amounted in 1940 to 15.5 million RM. of which 8.3 million were paid by third parties in the form of subventions and participations and 7.2 million by the holders of the restriped lands. Part of this last amount was covered by the surrender of 580 hectares of land for an estimated value of 760.000 RM. A further amount, standing at 820,000 RM. was covered by a loan obtained by the holders of the lands, the remainder must be paid in cash by them or in the form of labour contributed by men and horses.

France.

A beginning was made in France with the consolidation of holdings towards the end of the XVIIth century in the Duchy of Burgundy, at Rouvres-en-Plaine. Towards the end of the XVIIIth century consolidations were carried out in Lorraine, at Roville (Meurthe). At the beginning of the XIXth century, although no laws made it compulsory in the public interest, the consolidation of holdings

began to spread not only in the East, as previously, but elsewhere also. The operations betook however more of the character of personal exchanges of parcels of land than of restriping properly speaking.

Since the war of 1914-18, after the first law enacted in 1918, and apart from the 200,000 hectares restriped in the war devastated districts, some 100,000 hectares of land have been restriped in France at the request of the owners, and personal exchanges of parcels of land have been carried out on 367,000 hectares. In all 615 consolidation proceedings were carried out in 23 *départements*, affecting an area of 300,000 hectares (1). But the area in need of consolidation is estimated in France at 9 million hectares.

The results secured by the Act of 1919 are undoubtedly considerable in the devastated areas of the North and East, where a great work of improvement in the conditions of agricultural holdings, fully paid for by the state, could be carried out. Yet, the effort so far made to assure the consolidation of holdings is inadequate when compared to the work which still remains to be done, especially if the purpose is to exercise an adequately rapid action for the increase of agricultural production. "It is distressing to note"—writes M. Gault, "the inadequacy of the land-owners in most of our French *départements* who have either not known or not wished to avail themselves of the provisions of the Act of 27th November 1918 or of those of the more recent decree of 30th October, 1935" (2).

For centuries the *département* of the Meurthe-et-Moselle has been the most active in carrying out consolidation schemes. In 78 districts where 45,000 hectares have been restriped, 12,500 owners possess 175,000 parcels of land. The average size of the holding is only 3.6 hectares for farms occupying 3.8 separable parcels of land per hectare, each parcel averaging an area of 26 ares. Restriping has reduced the number of parcels by 71 per cent., with an average of 1.1 parcel of 89 ares per hectare.

As an example, we will again refer to the consolidation of holdings undertaken from 1921 to 1931 in the *département* of the Somme under the Act of 4th March, 1919 (3):

Number of communes	140
Total area of these communes	94,765 hectares
Total area restriped	76,621 ,,
Number of owners affected by consolidation	21,778
Number of parcels before consolidation	245,670
Number of parcels after consolidation	49,479
Reduction, in per cent.	4.96
Average area of parcels before consolidation	31 ares
Average area of parcels after consolidation	1 ha 55 ,,
Average number of parcels per owner before	11.28
Average number of parcels per owner after	2.27

(1) CAZIOT, Pierre: La loi de mars 1941 sur la réorganisation de la propriété foncière et le remembrement. *Le progrès agricole et viticole*. Montpellier, No. 20, 18 May, 1941, p. 346.

(2) GAULT, A.: Le remembrement et la lutte contre l'exode rural. *Revue des agriculteurs de France*. August, 1938, No. 8, p. 306.

(3) LORIAT, A.: Le remembrement de la propriété foncière dans la Somme en application de la loi du 4 mars 1919. Ministère de l'Agriculture, Paris, December 1931, pp. 11 and 13.

Taken as a whole, the consolidation has led to the exchange of 5 former parcels of land against one new.

The total outlay on account of consolidation operations for which orders were issued from 1st January 1920 to 31st December, 1931 by the Service for the Reconstruction of Landed Property and by the Rural Engineering Service amounted to 4,898,400 francs.

As 76,621 hectares were restriped, the cost of consolidation standing in round figure at 64 francs per hectare.

If the gains accruing from consolidation are placed as low as 200 francs per hectare the annual benefit arising from the restriping of 76,621 hectares amounts to some 15 million francs obtained at an outlay made once and for all of 4,898,400 francs.

Italy.

In Italy the work of consolidation of holdings is still in its initial stage. So far there are but few examples of the consolidation of holdings in the land reclamation districts. Nevertheless, a few interesting instances can be noted in the great land reclamation district of Lower Friuli (1).

A recent ministerial decree approves a plan for the rearrangement of scattered holdings in the neighborhood of the former Lake of Arsa and in the land-reclamation district of Istria in the province of Pola. Restriping is being carried out there on 2,000 hectares belonging to eight districts. This area was broken up into 1354 parcels of land belonging to 1184 owners. As a result of the restriping now approved, the number of parcels will be reduced to 534 and the number of owners to 504. In this way, scattered parcels of land belonging to one owner will be brought together into profitable holdings, and so will those belonging to several members of a same family. At the same time a great number of tiny holdings will disappear, generally with the consent of the owners, as in view of their excessively small size and of the distance from the dwellings of their owners it would have been practically impossible to carry out the land reclamation work The cost to the owners of the restriping is trifling, as the Government meets 92 per cent. of the outlay.

Switzerland.

The agricultural census of 1929 shows that in Switzerland there are 236,000 farms occupying a total cultivated area of 1,446,447 hectares; they consist of 2,508,602 parcels of land, with an average of a little over 10 parcels per farm. The average size of these parcels is less than 60 ares. The holdings have therefore been very considerably broken up.

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(1) Information supplied by the Rural Press and Propaganda Committee of the Ministry of Agriculture and Forests, Rome, 21st November, 1941.

In 1929 Switzerland had 39,328 farms all in one piece, i. e. 16.5 per cent. of the total number; 27,656 farms consisted of two parcels of land only, i. e. 11.7 per cent. of the total, 55,947 (22.8 per cent.) consisted of 3 to 5 parcels, 47,073 (19.9 per cent.) consisted of 6 to 10 parcels, and 68,871 (29.1 per cent.) consisted of more than 11 parcels of land. But in some cases farms are composed of as many as 50, 100, and even 150 parcels of land. The largest number of holdings all of one piece is found in the Canton of Berne; but the largest relative number (i. e. in relation to the total number of farms) is found in the Cantons of Appenzell and Lucerne. The fragmentation of holdings has been carried to the greatest extreme in the Canton Ticino, and the average size of the parcels shows that the holdings which have been most broken up are the small ones.

Heretofore land improvements have consisted chiefly in the provision of irrigation ditches and drainage works, and in the opening of farm roads and paths ([1]). In the last twenty years the consolidation of farm holdings and vineyards occupies an important place by the side of these improvements.

So far 91,000 hectares, i. e. one sixth of the area in need of restriping, have been consolidated at a total cost of 72,000,000 francs, 21.1 million of which have been provided by Federal grants. 519,000 hectares still required restriping. The largest area requiring consolidations, which amounts to 129,000 hectares, is in the Canton of Bern, 70,000 hectares in the Canton of Vaud, 60,000 hectares in the Grisons, 56,000 hectares in the Canton of Zurich, 50,000 hectares, in the Valais Canton. Cantons where the need of consolidation of holdings is less felt are Lucerne (10,000 hectares.), Basle (3,000 hectares), and Geneva (2,000 hectares).

The cost will amount to 519,000,000 francs or an average of 1000 francs per hectare. The cost of the total improvements required, including land drainage and the making of roads and paths, is estimated at 891 million francs of which 380 million have already been spent, and of these 95,6 million have been covered by Federal grants. The execution of the programme will be spread, of course, over a great number of years.

The present scarcity of rural labour, taken away from the land by the army and by industry, will make it practically impossible to carry out the great land improvement works in the time originally planned. To secure the labour necessary for the work the Cantons will have to take the requisite measures and, if need be, under the provisions of the order issued by the Federal Council on 11th February 1941 dealing with the provision of workers for agriculture, and the order of 17th April, 1941 on the employment of labour for building works of national importance, they will have to come to an understanding with the Office of War Industries and the Office of Labor.

How to obtain cheap credit for land improvement works is another matter of importance In Tanner's opinion the land-improvement co-operative societies have been for years past overindebted, the service of loans amounting in some

([1]) TANNER, E.: Bedeutung und Aufgaben der Meliorationen im Dienste des Mehranbaus. *Schweizerische landwirtschaftliche Monatshefte.* Bern, 1941, No. 2, pp. 34-37.

cases to 12 per cent. of total costs. Professor Kramer, supported by the Swiss Peasants' Union, advocates the creation of special credit institutes, mortgage banks, land-improvement banks, etc., for providing credit for land improvements.

Tanner considers that the difficulties of the present situation led the Canton of Zurich and the Caton Vaud to take the following provisional measures for facilitating the financing of such undertakings: the period of amortization has been reduced to five years, and for small undertakings to three years, whereas for landowners of small means the time allowed may be twice that now customary. The first annual contribution is paid during the year in which the co-operative society is formed. At the end of each year the Canton makes a grant equal to the amount contributed by the landowners. This temporary measure, however, will hardly solve the problem of obtaining cheap credit for land improvement works, including the consolidation of holdings.

Bulgaria.

In Eastern Europe the consolidation of holdings and restriping have been carried out to a large extent in connection with the agrarian reform, but accurate data on the matter are not now available. We will limit ourselves to a few words on what has been done in this respect in Bulgaria. Consolidation schemes are carried out under the direction of the Government or of the communes. During a period of 12 years, from 1926 to 1938, restriping has been completed for the lands of 55 villages occupying an area of 202,000 hectares, being 5 % of the total area under cultivation. Including the villages where restriping is being carried out at the present time, the area stands at 360,000 hectares, i. e. 8.3 % of the total cultivated area.

Consolidation work was continued in 1938-39, when larger appropriations were made for that purpose in the budget of the Ministry of Agriculture and Lands. During that year the preparatory work for restriping the lands belonging to 65 villages occupying an area of 204,656 hectares was completed. The actual work is now being carried out [1].

VI. — Various difficulties in the way of the consolidation of holdings.

Although the excessive fragmentation of holdings makes farming more difficult and reduces the yields, a radical solution of the problem generally meets with many difficulties. The chief difficulty would seem to be the individualistic mentality of the peasantry and their attachment to the bit of land which has belonged to their family for several generations; indeed it would be more correct to speak of their love for that bit of land. It is interesting to consider in this connection what Prof. BRIZI had to say on the attitude of the peasants of the

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(1) The World Agricultural Situation in 1938-39. International Institute of Agriculture, Rome, 1940, p. 180.

Campania, to which reference vaw made in the report prepared by the International Institute of Agriculture for the European Conference on Rural Life on the Land Tenure Systems in Europe (1).

"Merely for the purpose of our investigations", he writes, "we have from time to time asked peasant proprietors their opinion as to the possibility of consolidation. It would not be correct to say that they were against such a thing. It would be more true to say that they did not even regard it as a possibility. So powerful and unshakeable in the peasant mind are the conceptions of *meum* and *tuum*, particularly in connection with land. But this particular obstacle should not be overrated. A properly conducted experiment on a large scale might well convince the peasant, who is very intelligent and always ready to discuss and to learn" (2).

According to Prof. MÜNZINGER (3) to propose restriping in a village district of South Germany prior to the war of 1914-18 was equivalent to causing a sort of revolution among the inhabitants of the district and threw them into a state of incredible agitation; they only settled down as a rule after the work had been completed, when their fears made way for general satisfaction. On the other hand, HOSTER (4) notes that in a district of Lower Silesia there existed, according to information supplied by the former Land Improvement Office of Breslau, a secret association to oppose restriping to which higher contributions had to be made than those which would have been levied by the authorities for restriping operations.

Among the arguments brought forward against the consolidation of holdings the question of expenses plays an important part. Indeed, in the early days the expenses were really very high, especially in the case of a voluntary agreement among the parties concerned, and when the land surveyors had not yet acquired wide experience in the matter (5). It should however be remembered that the Government generally meets a considerable part of the cost and makes grants and loans to cover that part which is met by the parties concerned. The outlay is afterwards made good in the course of a few years by the larger returns which the owners secure from the consolidated holdings.

Another objection raised to restriping is that its effects are not permanent. It eliminates the drawbacks of excessive fragmentation for a time, but does not prevent subdivision from recurring, especially in connection with the division of farms among the heirs. After two or three generations the holdings will again require restriping. The value of the consolidation is therefore limited, as it only deals with the result of the free division of the holdings among the heirs and does

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(1) DOCUMENTATION FOR THE EUROPEAN CONFERENCE ON RURAL LIFE 1939. International Institute of Agriculture. Rome, 1939, p. 91.

(2) INCHIESTA SULLA PICCOLA PROPRIETÀ COLTIVATRICE NEL DOPOGUERRA. Vol. IX, Campania, Istituto Nazionale di Economia Agraria. Rome, 1933, p. 16.

(3) *Berichte über Landwirtschaft*, 1936, Berlin, New Series, Special booklet, p. 11.

(4) HOSTER, W.: Die Flurregulierung, insbesondere ihre verstärkte Förderung und ihr gegenwärtiger Stand in Preussen und Bayern. Berlin, 1930, p. 27.

(5) DECK, *op. cit.*, p. 48.

not reform the inheritance laws affecting rural landed property which are at the root of the evil.

It should here be noted that apart from the fact that much of the legislation on this matter provides measures for preventing a further dispersion of property by fixing a minimum size for the parcels of land which may constistute a lot, or by laying down conditions regulating further divisions, the most recent enquiries show that the fear so often expressed that a further fragmentation of the property might follow the consolidation, is groundless. It would seem that the reason for this is that the consolidated holdings can be farmed more rationally and that parcels of land which become available are purchased by the neighbours.

In the opinion of the Technical Agricultural Committee of the Reich (1) a holding which has once been consolidated continues so even should a division be made, and a period of 150 years elapses before the former conditions can recur. And even should subsequent restriping be needed, the difficulties will never be as serious as they were on the first occasion, as the system of roads and ditches which were made at the time of the consolidation remains.

In the Rhineland, for instance, thorough enquiries have been made to ascertain whether, after the consolidation has been carried out, the number of parcels of land has increased or decreased, and results show that the number of parcels which existed after restriping has decreased. This is due to the fact that the peasant endeavours to reunite by purchases, marriages, or other means, holdings which have been broken up as the result of division among heirs.

Other objections have been made to consolidation to the effect that it would lead to the expropriation of lands and would interfere with private property rights.

Consolidation does indeed imply a marked interference with private property, but an interference justified by a right undertstanding of the best interests of private property itself.

"If the system of compulsory consolidation" writes Prof. TASSINARI, "apparently runs counter to the right of an owner to dispose of his property as he sees fit, it should be remembered that such a right runs counter to a superior interest which councils consolidation. The right of the individual to dispose of his property cannot in modern society be absolute as it was in the Roman conception of property, and there are cases when it is essential to place restrictions on that right if the general interest is at stake... It therefore seems to us that just as all principles must bend to the exigencies of social life, so the consolidations of holdings must be carried out regardless of whether they have the unanimous consent of all concerned, and in spite of the opposition of a minority" (2).

Such arguments, however, have little weight in combatting the conservative spirit and the traditional ideas of the peasantry, and the consolidation of hold-

(1) Reichskuratorium für Technick in der Landwirtschaft, Berlin, 28 october 1931.
(2) TASSINARI, Prof. Giuseppe: Frammentazione e ricomposizione dei fondi rurali. Florence, 1922, p. 4.

ings often meets in farming circles with opposition which it is difficult to overcome. The approval of the farmers can only be secured if one succeeds in explaining and proving to them the practical value of restriping.

VII. — The economic importance of the consolidation of holdings.

The many difficulties in the way of eliminating the excessive fragmentation of holdings must be considered with due regard to the real advantages secured by the consolidation when it has once been carried out.

When the holdings are consolidated compulsory rotation makes way to a freely chosen rotation of crops which enables each owner to organize his farm as he sees fit without being restricted by the regard he must have for his neighbours. The many boundary disputes and the lawsuits to which they give rise, cease as the new boundaries of the holding are clear.

Consolidation as a rule increases the crop area as it does away with the hedges and landmarks which occupy an unproductive area, and the length of the boundary ridge is considerably reduced. From 3 to 6 per cent. of the total area of a holding is thus recovered, the percentage depending on the thoroughness of the consolidation and on the number of parcels of land. Should land be required in connection with the consolidation for different kinds of land improvements, the crop area may be reduced, but the loss is offset by the fact that the whole area can be cultivated more intensively.

On consolidated holdings it is possible to use agricultural machinery suited to the requirements of small and medium-sized peasant farms. The present scarcity of agricultural labour gives great importance to such possibilities of labour-saving.

The restriping of landed property is one of the most effective means for promoting agriculture in general and more especially for increasing the yield of labour.

The enquiry into land consolidation published by the Chamber of Agriculture of Meurthe-et-Moselle (Nancy 1933) which deals with conditions in 78 communes restriped in the *département* of Lorraine, show that most of the farmers who were questioned considered that they had saved one quarter of the time formerly required for the cultivation of their holdings. An annual saving of 50 to 300 francs per hectare is generally secured after the consolidation has been carried out. As this saving is made at the time when expenses are heaviest, when the crops are being sown and harvested, its importance for the farm greatly exceeds that which can be expressed by mere figures.

The saving of labour secured as a result of consolidation enabled Dr. André to come, on the basis of the data supplied by the farm accountancy office of the Chamber of Agriculture of Hesse, to the following conclusions (1).

(1) *Landarbeit*, Berlin, 29 June, 1929.

He studied the labour costs for a series of farms yielding a good, medium, or low return, classifying them in six classes according to the average size of the parcels of land, i. e. 0.25 hectares, from 0.25 to 0.50 hectares, from 0.50 to 1 hectares, from 1 hectares to 2 hectares, from 2 hectares to 5 hectares, and over 5 hectares. He thus ascertained that the labour costs for men and animals expressed in units of man-work per annum and in units of animal-work per annum for each 100 hectares of cultivated land decrease progressively in inverse ratio to the size of the areas cultivated. For farms consisting of parcels of more than 5 hectares yielding a good return the cost of man-work is on the whole 45 per cent. less than for holdings broken up into minute lots of less than 0.25 hectares. In the case of farms yielding medium returns it is 65 per cent. less, and in the case of farms with low returns the labour cost for consolidated holdings is only 41 per cent. of that for those which are broken up in small parcels.

As a rule the labour costs on a holding with parcels of more than 5 hectares are 30 to 50 per cent. less than on holdings with parcels of 0.25 to 0.50 hectares. The saving for draft animals is much the same, in the case of farms in the most favoured conditions and for those which have been restriped.

M. Vezdnaud gives examples for France and shows the advantages secured by restriping. Thus for instance, a holding of 14 hectares which was divided into 28 parcels, has been consolidated into one piece, and as a result instead of cultivating each day 40 ares, as was previously done, 60 can now be cultivated, thus securing a saving of 33 per cent. The labour yield is thus directly affected by the consolidation of holdings [1].

On an estate of 160 hectares which after consolidation still consisted of 25 parcels of land, the following results were obtained:

	Before consolidation	After consolidation
Horses required	24	18
Farm servants	8	6
Carts	8	6
Implements	Reduced by one quarter.	

The labour saving secured allowed of the discarding of 6 horses and 2 farm servants, equivalent to a saving of 43,800 francs. per annum if the wages of a servant and the cost of a horse be put at 15 francs. per day. The saving on the purchase and upkeep of implements was not less than 2,500 francs., bringing the total reduction of costs up to 46,300 francs. per annum, or 289 francs. per hectare.

The shape of the parcel of land is also of importance from the point of view of saving farm labour, as an irregular shape causes great loss of time. Dr. Krumm, of the Economic Division of the German Society of Agriculture, studied in 1927

(1) Le remembrement. Report to the Xth Congress of Agricultural Mutuality and Co-operation, 1922, Paris, p. 69.

the cost of labour on two farms in Wurtemberg. The natural conditions of the two farms were much the same, but the situation of the parcels of land as regards distance from the farm and shape and length were totally different. The position of holding A was admitted to be quite good: the distance of the parcels of land from the farm was relatively short, the furthest off being at a distance of 755 metres from the main part of the farm. The length of the parcels was in almost all cases over 400 metres, and their average size 14 hectares. On the other hand, holding B comprised parcels of land situated at a much greater distance from the farm, some being 3,500 metres distant, their length varied in most cases from 100 to 180 metres. The holding is broken up into 95 scattered parcels of land of an average size of 1.53 hectares each. The time required for working the land, exclusive of that required for the mere work of transport, was distributed as follows on each of the holdings:

Holding A: 14,850 hours of paid labour, of which 490 hours spent in going back and forth;

Holding B: 14,790 hours of paid labour, of which 2,799 hours spent in going back and forth.

Thus in order to perform 100 hours of work on the land 3.4 hours were required for going back and forth on holding A and 18.9 hours on holding B, which means that the time lost in going backwards and forward was almost six times as long in the latter case. Of the 490 hours required for going back and forth on holding A 417 hours, or 2.9 per cent., were spent in going and coming from the farm building to the fields (14,850) and 73 hours, or 0.5 per cent., were wasted in mere displacements. Of the 2,799 hours spent in going back and forth on holding B 1,977 hours, or 13.5 per cent. of the time worked in the fields (14,790), were taken up in going and coming from the farm building to the fields and 802 hours, or 3.4 per cent., were wasted in displacements.

Thus the connection between the cost of labour on a holding which has been suitably consolidated, and on one broken up into a number of parcels of land is evident, as is also the influence which the irrational structure of a holding may have on the profits of the undertaking (1).

The increased yields obtained as a result of consolidation can be estimated on an average at 25 %. The area requiring restriping in Greater Germany is not less than 7 million hectares. If restriping will secure an increase of 5 quintals of wheat per hectare, an increased yield of some 35 million quintals of wheat may be expected as the result of the consolidation of holdings, an addition almost equal to the total annual production of wheat in Germany (2).

In France it is estimated that the restriping of rural property might increase crop yields by one half. The annual farm income might thus be raised from 20,000 million francs. (pre-war value) to 30,000 millions (3).

(1) L'ORGANISATION SCIENTIFIQUE DU TRAVAIL AGRICOLE EN EUROPE. International Institute of Agriculture, Rome, 1931, pp. 116-118.

(2) *Wiener landwirtschaftliche Zeitung*, No. 28, 1938.

(3) GÉOGRAPHIE UNIVERSELLE QUILLET, Tome II, quoted by Crétien. Le partage en nature et les héritages ruraux, Lyon, 1937, p. 81.

These are of course only approximate estimates but they clearly show the importance of the consolidation of holdings for the national economy.

The relation which exists between the degree of consolidation of a holding and its gross yield is very clearly shown by comparing the economic results secured on a holding which was restriped, for which careful accounts were kept before and after consolidation. In the following table M. ALBERT HÜNI, Chief of the Land Income Division of the Swiss Peasants Secretariat, shows the evolution of gross return on a restriped and on a broken-up holding in the same region. So as to eliminate the influence on the gross return of fluctuations in the price of agricultural products we give index numbers as well [1].

Gross Return on a consolidated and on a broken-up holding in the same region.

Year		Gross return in frcs. per ha.		Index of gross cash return 1920-22 = 100	
		Consolidated holding C	Broken-up holding B	Consolidated holding C	Broken-up holding B
Both holdings when broken up	1920	1,266	1.013	100	100
	1921	922	878		
	1922	855	760		
C Consolidated holding B Broken-up holding	1923	1,047	673	103	76
	1924	1,062	692	105	78
	1925	1,135	711	112	80
	1926	772	589	76	67
	1927	938	666	93	75
	1928	1,089	876	107	99
	1929	1,118	597	110	68
	1930	1,042	736	103	83
	1931	1.051	710	104	80
	1932	765	605	75	68
	1933	1,000	584	99	66
	1934	876	666	86	72
	1935	1,027	638	101	74
	1936	1,010	564	100	65
	1937	1,212	661	120	70
	1938	979	616	97	73
	1939	1,120	641	110	75

The index-numbers have been calculated taking the gross average return for the years 1920-22 as 100 for both holdings, and calculating on that basis the gross return for the other years. As the figures show, the gross return for each year of the period 1923-1939 has always been higher for the consolidated than for the broken-up holding. Moreover the index number for the gross return of

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(1) HÜNI, Albert; Der Einfluss der Landverteilung auf die Betriebsergebnisse. *Schweizerische landwirtschaftliche Zeitschrift*, Zurich, No. 27, 4th July, 1941, p. 717.

the consolidated holding has almost always exceeded the index for the average gross return for the period 1920-1922 (with the exception of the four years 1932, 1933, 1934 and 1938), whereas the index for the gross return from the unconsolidated holding in the period 1923-1939, is lower than the index of average gross return for the years 1920-1922.

The index number for the gross return of the consolidated holding, even when it falls below 100, is still considerably above that for the unconsolidated holding in the same years.

M. Hüni has also made comparisons for holdings which are similar to each other as regards the leading factors of production, more especially as regards the mode of farming the land, and on which the costs of labour and the gross return differ only as affected by the different degree of fragmentation.

Comparison of the cash returns secured on holdings characterised by varying degrees of fragmentation but farmed in like manner [1].

(Average for the year 1933-1939).

Kind of farming and degree of fragmentation	No. parcels per holding	Cost of labour per hectare	Gross return		Net return per hectare	Capitalized value of net return per hectare
			per hectare	per 100 frcs of labour costs		
		Fr.	Fr.	Fr.	Fr.	Fr.
Holdings with improved three year rotation:						
unfavourable	28	478	1,034	216	108	1,260
average	23	459	1,132	247	168	2,524
favourable	10	394	1,133	288	233	3,744
Grass farms with some fields:						
unfavourable	19	498	1,052	211	117	775
average	15	427	1,086	254	206	3,586
favourable	7	426	1,204	283	261	4,868
All groups of exclusively grass farms:						
unfavourable	22	465	975	210	86	419
average	10	432	1,085	251	142	2,171
favourable	5	455	1,245	274	261	4,935

(1) Condensed from M. Albert Hüni's table.

The table shows that for each kind of farm the cost of labour on the broken-up holdings is higher than on those consolidated. Labour costs do not, however, decrease in the same ratio as the number of parcels of land, as the consolidated holdings are generally farmed more intensively, and the labour set free is used on new works, which in their turn increase the gross return. Even when the cost is not reduced, the labour is used to much better purpose.

The gross return, the net return and the capitalized value of net return of the unconsolidated holdings are relatively low; thus the net return per hectare on the consolidated holdings was two or three times, that obtained on the unconsolidated.

Interesting enquiries also show the increase of gross returns and the reduction of labour costs, secured by land improvements, inclusive of restriping, throughout Switzerland. The data used in making these enquiries are generally those supplied by farmers and based on estimates; on the other hand, the figures showing the influence of consolidation on the results obtained on the farms have been calculated by M. E. NÄF, with the assistance of the Swiss Peasants Secretariat [1].

Annual increase of gross return due to land improvements throughout Switzerland.

1. – Drainage	81,000 ha. to	450 frs. per ha. and per year	36.4 mill. frs. per year
2. – Consolidation . . .	91,000 ,,	60 ,, ,, ,,	5.4 ,, ,, ,,
3. – Vineyard improvements	800 ,,	2,000 ,, ,, ,,	1.6 ,, ,, ,,
4. – Other improvements.			5 ,, ,, ,,
		Total increase of gross income . . .	48.4 mill. frs. per year

The annual increase of gross agricultural return secured in Switzerland by the restriping of 91,000 hectares thus amounts to some 5.4 million francs, or one ninth of the total increase of the gross annual agricultural return secured by the land improvements so far carried out, many of which have only been made possible by restriping.

The reduction in labour costs allowed by restriping amounts, according to M. Näf's enquiries, on an average to 45 francs. per hectare per annum. Thus for the 91,000 hectares already restriped, the reduction stands at some 4.1 million francs. per annum. If the wages of a labourer be reckoned at 1,800 francs. per annum, this means a saving of 2,200 labourers.

Judging by the results so far obtained, the carrying out of all these land improvements will further increase the gross Swiss farm return by some 70 million francs. per annum. At the same time the consolidations which still have to be made will reduce farm labour costs by some 23 million francs. per annum. The saving in labour will amount to some 12,500 labourers.

[1] TANNER, E. *op. cit.*, pp. 35-36.

* * *

The economic importance of the consolidation of landed property is clearly shown by the enquiries made under different economic conditions of agriculture. By consolidating their holdings, owners can secure a higher income and the national economy can secure the advantages consequent on the more prosperous condition of agriculture. It is therefore in the interest of the nation to encourage the consolidation of holdings as a means for promoting a sound distribution of landed property by forming economically rational farms.

VIII. — Conclusions.

The consolidation of holdings may be considered as one of the most efficient instruments of agrarian policy aiming at the conservation and consolidation of small agricultural property.

The cost of restriping is certainly an important, but not a decisive, factor, as the cost incurred is amply repaid by the increased yield and higher value of the land. Unfortunately, the work of consolidation is still carried out on too limited a scale.

To induce the rural population to consent more willingly to restriping, legislation on the subject is required suited to the special conditions prevaling in each country. For now, when it is of the greatest importance to strengthen and consolidate the peasantry so as to conserve the strength of the nations and enable them to live on the produce of their own soil, the consolidation of holdings, considered as an essential prerequisite for general land improvements, is not only a matter of economic significance but of great social and demographic importance. The latest legislation on the consolidation of holdings considers such work as of public utility, the initiative for which can be taken by the authorities, and a majority of the landowners may compel the minority to accept, for the benefit of all, the decision taken in favour of the work. This gives full force to the words of John Stuart Mill who wrote: " the reasons which form the justification of private property in land are valid in so far as the proprietor of the land is its improver ".

The objection raised to the consolidation of holdings based on the ground that such operations amount to expropriation, and that therefore they violate property rights, cannot well be sustained. As has often been noted, the right to own property is a social institution, which is the expression of economic conditions subject to change. It is precisely with a view to remedying the consequences of the inevitable changes caused in the long run by the distribution of the land, and with a view to doing so on a systematic plan, that society has reserved to itself the right of expropriation.

All classes of landowners can benefit by the consolidation of holdings, but more especially the owners of small holdings which suffer more than any others from the drawbacks of excessive fragmentation and the scattering of the parcels of land. Consolidation is therefore of very great social importance as a means for improving the return of small holdings and their general conditions.

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N. B. — Between brackets [/] are given translations and explanatory notes not appearing in the title of the review.

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Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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THE PROGRESS OF URBANIZATION IN THE WORLD (1)

by Dr. HUGO BÖKER.

The great increase of population in the last hundred years has been accompanied in all the more advanced countries by a rapid progress of urbanization. Following close on the ups and downs of the economic development the ratio of urban population to total population has been increasing, now slowly, now by leaps and bounds. The growth has no relation to the natural rate of increase of the urban population which, with few exceptions, was below that of the rural districts. Only by the steady and large influx of people from rural to urban districts could the urban population have been increasing at such a rate. Nor was it always from the country's own rural population that the migrants came; the cities of the New World owe their growth largely to the influx of foreign immigrants.

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(1) Since the very beginning of its activity the I. I. A. has followed the various aspects of the relations between population and agriculture, a problem of ever increasing importance. In this connection, we should put on record, among other studies, those concerning rural exodus (*TheRural Exodus in Germany*, Rome, 1933 and *The Rural Exodus in Czechoslovakia*, Rome, 1935); the problem of *Agricultural Overpopulation* (Documentation for the European Conference on Rural Life, 1939); *White Settlement in the Tropics* (article in the July-August number of this *Review* for 1941). As belonging to the same domain, we should also mention the various studies bearing upon the different aspects of the improvement of the conditions of rural life, such as the report presented to the European Conference of Rural Hygiene in 1931 on *Rural Housing in Europe*, as well as several articles on the same subject published in this Review.

The problem of urbanization is discussed here for the first time on the basis of the vast statistical material on this subject collected by the Institute.

Urbanization in the course of time has become a serious problem for many countries, more especially since, during the past few decades, demographic conditions underwent a fundamental change.

As is only natural, agriculture is keanly interested in this question, whose effects make themselves felt in many directions, for it is almost the same phenomenon which, considered from the standpoint of the countryside, is generally described as rural exodus. Moreover, in many countries demographic considerations have been acquiring ever greater importance as one of the determining factors of their agricultural policy.

Numerous as are the publications on urbanization, yet one seldom finds comparative tables illustrating its development even if only in a few countries. The great difficulties in the way of such a comparison depend not least on the different definitions of urban and rural population given in the several countries. We will therefore start by submitting a few considerations on the definitions usually accepted. Then we will glance at the development of urban and rural population in a number of countries. The figures given, unless other sources are quoted, are those of the official statistical publications of the countries referred to.

I. — The distinction between urban and rural population in the statistics.

The several possibilities.

A glance at the methods followed in the several countries for dividing the population into urban and rural shows the great difficulties in the way of a clear definition of the terms " urban " and " rural ".

One cannot, for statistical purposes, take into consideration divisions based on such concepts as mode of life or attitude towards life. All the methods used are more or less derived from the division into town and country, into urban and rural communities, places, districts, areas, etc., in conformity with which divisions the whole population is described as urban if dwelling in urban or as rural if dwelling in rural communities, places, districts or areas. Thus understood, the concepts of " rural " is not identical with that of " agricultural ", a fact which should be stressed to avoid misunderstandings. Under this mode of definition all persons residing in rural districts are included in the rural population, regardless of whether they belong to the most important branch of rural economy, agriculture, or are merchants, artisans, or teachers, or just persons residing in the country but having their occupations in town.

For the distinction between " urban " and " rural " the following characteristics have acquired practical importance: (1) the administrative status of the community, district or place, (2) the number of inhabitants of the community or of its chief residential centre or places; (3) the occupational structure of the population.

Several other characteristic features have been suggested and more than once have been used, such as the degree of agglomeration or of density of population. In the first case, the ratio of the agglomerated population to the total population is accepted as standard of the urbanization, or else the agglomerated population is merely classed as urban. Calculations of the agglomerated and scattered population may be of value in their bearing upon many social or administrative questions, but they do not suffice for determining the urban or rural character of a population. This is also the case with the distinction based on the density of the population, whether calculated for the total, built or cultivated area. Classification based on this factor, and more especially historical comparisons based on it, is subject to many objections and there are many difficulties in the way of making the calculation, so that the method is of little use for dividing the population into urban and rural. On the other hand, the value of density calculations for explaining many social and economic questions relating to urban settlement is unquestionable.

Recourse is mostly had to methods of classification based on the administrative status of the community or district, or on the number of its inhabitants, or on the occupational structure of its population. As we shall see further on, these three characteristics are used either singly or in pairs, coupled together or side by side.

The method of classification chosen may cause the size of the urban or rural population to vary greatly. A clear and statistically accurate distinction between town and country does not exist. If in the several countries the methods vary so widely, this is due not only to the acceptance of different principles of statistical classification, but also to the different kinds of land settlement and administrative divisions and, last but not least, to the different nature of the problems which it is desired that the facts ascertained should help to explain.

The advantages and disadvantages of the three methods generally used will be briefly dealt with below.

Distinction by the administrative status of the communities or districts.

The division between urban and rural area based on the administrative status is the simplest of the three above mentioned possibilities. With few exceptions it is easy to ascertain whether a community district is urban or not, the contents of the charters which determine the legal status of towns in a given country are much the same throughout its whole territory. For throwing light on questions affecting population policies or on social or economic questions this division is however often inadequate. Most towns are indeed still economic and cultural centres, but the division is valueless in those cases in which displacements of population are most marked, that is in the suburbs of great cities and more especialy in industrial regions where often quite small rural townships rapidly grow into great agglomerations of population with a definitely urban character, while still retaining for a long time the administrative status of a rural community or district.

Distinction by the number of inhabitants of the communities.

In this case the communities are grouped according to the number of inhabitants. Up to a fixed number of inhabitants, the communities are considered rural. This system has the advantage of being clear and simple. Yet there is always something too schematic and arbitrary in fixing the upper limit of population for a rural community at 2,000, 2,500, 3,000 or 5,000 according to circumstances. The division between urban and rural areas is thus made without any consideration of the nature of the community. Two communities classified as rural on this basis may be widely different in character. Thus, a quite small community, whose whole population dwells in a single residential centre, may be purely urban in character, while another, extending over a wide area which, apart from a small civic centre, may consist entirely of scattered dwellings, and a third comprising two, three, four or more villages which taken all together have a considerable population, may yet be purely rural in character. Such different kinds of communities may be found side by side in the same country.

An advantage of this over the first mode of demarcation above described is that it affords greater opportunities for following changes in the course of time. Should the population of a rural community grow beyond the fixed limit, it will be reckoned as urban. But it does not necessarily follow that the character of the community had actually changed.

A weakness of the system for purposes of historical comparison depends on the fact that by deducting the whole population of a community which exceeds the number of inhabitants fixed for a rural community, on the one side, and entering them on the other side, one may over-emphasise an existing trend. To avoid giving rise to such misrepresentations, in some countries the statistical services not only make historical comparisons based on the present size of the communities, but also another comparison based on the distribution of the communities in the same size groups in the different censuses. Certainly such a presentation is not easy, and when several censuses have to be considered it often involves such difficulties that the comparison has to be limited to two censuses only. The reduction of the figures of different censuses to the same basis involves the consideration not only of the growth of the population, but of the changes in the frontiers of the communities as well.

The grouping of communities according to the number of inhabitants can be so refined that the classification is made not on the basis of the total population, but on that of the population concentrated in the chief residential centre. This method has been used since 1846 in the French population census. In this case the character of the settlement within the community is taken into consideration. Large communities composed of several purely rural places are thus classified where they belong, being considered rural.

So as to enter yet more fully into the nature of the settlement within the community it has been suggested that a classification be based not on the size of the communities, but on that of the places, and in some countries this has

been done. Whether the community or the several places be taken as the basis is however a question which must always be determined by the mode of settlement and the administrative divisions of the country.

Distinction based on the occupational character of the population.

The classification of the population on an occupational basis constitutes a third mode of demarcation. This can be made either on the basis of the ratio of the population occupied in agriculture to all occupied persons, or on that of the ratio of the agricultural population (persons occupied in agriculture and their dependents) to the total population. A community or district is considered rural when a given percentage of the occupied or of the total population is agricultural; it is considered urban when the ratio falls below the agreed level; and correspondingly the whole population of the district is reckoned as rural or urban.

In most countries the grouping of communities on this basis is not, however, possible as geographical subdivision of the returns of the occupational census has not been carried so far down. The objection sometimes raised that the acceptance of a given percentage of agricultural population as a basis for distinguishing the urban from the rural population is arbitrary, and is not convincing. Without such arbitrariness, however, no division between urban and rural population is possible.

It has sometimes been suggested that, as a means of improving the classification of communities on the basis of another principle, such as, in the first instance, the number of population in the community or in its chief residential centre, recourse should be had to occupational grouping.

Proposal for a uniform international definition of urban and rural population.

The importance attached to a suitable and clear classification of the population into urban and rural, and to the comparability of the systems used in the several countries is shown by the fact that the question was raised at the IVth International Statistical Congress held in London in 1860. That Congress recommended that all communities or places with more than 2,000 inhabitants should be considered urban. A large number of countries acted on this recommendation.

Two reports showing the present state of the distinction between urban and rural population in the several countries were presented by the French statistician Henri Bunle at the session of the International Intitute of Statistics held at Prague in 1938 [1].

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[1] BUNLE, Henri: La population rurale. Sur le choix d'une définition susceptible d'être internationalement adoptée. *Bulletin de l'Institut international de Statistique*, Vol. XXX, 2nd part, La Haye, 1938. — BUNLE, Henri: Rapport de la Commission pour la définition de la « population rurale ». *Ibidem*.

Bunle was entrusted by the bureau of the Institute with the study of the possibility of setting up a uniform definition of rural population acceptable for most countries. In studying the matter Bunle sent a questionnaire to the statistical services of 35 countries asking for the definitions used by them and their wishes in regard to unification. The result of this enquiry, which was answered by 29 countries, is given in his first report. A summary of the replies received shows that very different definitions are used by the several countries. In some the purely administrative point of view prevails (England and Wales, Australia, Brazil, Bulgaria, Canada, Denmark, Estonia, Japan, Latvia, Norway, Sweden), in others the population is held to be rural in communities with less than 1,500 inhabitants (Ireland), less than 2,000 (Germany, Austria, Czechoslovakia, Turkey), less than 2,500 (Mexico), 5,000 (Belgium, Holland, Greece) or 10,000 (Greece in certain statistics). In the United States the population of all cities and other incorporated places having 2,500 inhabitants or more, is considered urban; in France the whole population of all communities in which the population resident in the chief centre exceeds 2,000 inhabitants. In Switzerland and in certain Dutch statistics the division is based on the number and occupational structure of the population. Lastly, in Belgium the density of the population is used as a criterion for many statistical purposes.

The answers received further showed that nowhere the system used was considered satisfactory. The desires, as far as unification was concerned, however, differed widely.

The Committee set up by the International Institute of Statistics for examining the material collected by H. Bunle came finally to the following conclusions: (1) the total population of communities classed as rural should be counted as rural; (2) the communities should, as far as possible, be grouped in three categories according to the ratio of the agricultural population (persons occupied in agriculture and their dependents), to total population; rural communities should be those with a ratio of more than 60 per cent. of the population, mixed districts those with 40 to 60 per cent. and urban districts those with less than 40 per cent.; (3) if for some reason this mode of classification should not be possible, the communities should be divided into those with a chief residential centre of not more than 2,000 inhabitants, and those in which the population of the chief residential centre exceeds that number.

This proposal marks a great advance, even if, for the time being, uniform classification cannot be thought of in numerous countries. That this is so, can be easily understood, as no country likes to change a system which has once been adopted, more especially when such a change will make comparison with earlier census returns impossible. Lastly, the system heretofore used has been arbitrarily selected only in a very few cases, and generally corresponds to the special conditions of the country, and to the purpose for which it was designed.

II. — The development and state of urbanization in the different countries.

Germany.

The classification of the population as urban or rural is based in German official statistics on the size of the communities. The communities are grouped in eight classes, according to the number of inhabitants. Those with less than 2,000 inhabitants form four classes; those with more than 2,000 four other classes. Communities with less than 2,000 inhabitants are described as rural, those with 2,000 and upwards as urban, and their respective populations are correspondingly described as rural or urban. An exception to this rule is made only in the case of Oldenburg. As in Oldenburg communities are frequently composed of several villages and isolated settlements, and as in this wise communities are formed having a considerable number of inhabitants, though of a purely rural character, the classification is based on the size of the villages. In certain censuses the distinction between rural and urban population is made for the whole territory of the Reich both according to the size of the communities and to that of the villages.

TABLE I. — Germany: *Rural and urban population from 1871 to 1939.*

Year	Total population in millions	of which in communities with... inhabitants			
		under 2,000		2,000 and more	
		millions	%	millions	%
		Former territory			
1871	41.01	26.22	*63.9*	14.79	*36.1*
1875	42.73	26.07	*61.0*	16.66	*39.0*
1880	45.23	26.51	*58.6*	18.72	*41.4*
1885	46.86	26.38	*56.3*	20.49	*43.7*
1890	49.43	26.19	*53.0*	23.24	*47.0*
1895	52.28	26.02	*49.8*	26.26	*50.2*
1900	56.37	25.73	*45.7*	30.63	*54.3*
1905	60.64	25.82	*42.6*	34.82	*57.4*
1910	64.93	25.95	*40.0*	38.97	*60.0*
		Territory of the Reich on 1. 1. 1938			
1910	58.45	22.39	*38.3*	36.06	*61.7*
1925 (1)	63.18	22.37	*35.4*	40.81	*64.6*
1933 (1)	66.03	21.62	*32.8*	44.41	*67.2*
1939	69.32	20.88	*30.1*	48.44	*69.9*

(1) For the Saarland the date of the census of 1927 or 1935.

As table I shows, the ratio of urban to total population has grown steadily since 1871, rising from 36 per cent. to 60 per cent. in 1910. In round figures, the urban population rose in that period from 14.79 to 38.97 millions.

Since the close of last century the urban population has become preponderant. Until the World War, the figure for the rural population remained practically unaltered around 26 millions. After the war (for the territory of the Reich as on 1st January, 1938) a large absolute decline in the rural population was recorded for the first time in the period 1925-33. It continued in the period 1933-39. The ratio of the rural to the total population stood in 1939 at not more than 30.1 per cent. The ratio of urban population had thus risen to 69.9 per cent. and the number amounted to 48.44 millions as against a rural population of 20.88 millions.

The displacement in the ratio of rural to urban population was partially accounted for by natural increase which caused the passage of some rural communities into the urban class, and by the incorporation of rural into urban communities, but, above all, it was due to the transfer of natural increase of the rural population to the towns.

The large towns and cities have been the chief beneficiaries of the widespread internal migrations which have taken place. The larger the town, the quicker has been its rate of increase.

In the period between the two last censuses (16th June 1933-17th May 1939), the growth of the population of the large cities [1] was somewhat below that recorded in the previous period. If for 1933 the different communities are classed in the same size groups as in 1939, we find that for the territory of the Reich as on 17th May 1939 (without the district of Memel), in the period 1933-1939 the communities with a population of not less than 5,000 and not more than 20,000 inhabitants, were those with the largest absolute (930,000) and relative (9.6 per cent.) increase of population, and that they accounted for 31.6 of the total increase in the population of the Reich. Next to them come the communities with not less than 20,000 and not more than 100,000 inhabitants, whose population increased by 797,000 units, i. e. 8.3 per cent.; they accounted for 27 per cent. of the total increase of the population. The population of the large cities increased by not more than 622,000 units, i. e. 2.6 per cent. It should be noted that the increase was less rapid as the size of the large cities grew. The population of the cities with over a million inhabitants had even diminished somewhat. The number of inhabitants of the rural communities had remained unchanged, so that the total increase in the population of the Reich, amounting to approximately 2.9 millions, was all absorbed by the urban communities.

On 17th May, 1939 the Reich, exclusive of the district of Memel (that is the territory on 1st January, 1938 with the Ostmark and the Sudetenland added) counted 56,268 communities, of which 51,727 with 31.6 per cent. of the total

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[1] By "large city" in this article we always mean a place with 100,000 or more inhabitants.

population were rural, and 4,541 with 68.4 per cent. of the total population were urban, the population being distributed as follows among the several size groups:

Communities with .... inhabitants	Resident population number in 1000	%
less than 2,000	25,052	31.6
2,000 to 4,999	9,144	11.5
5,000 » 19,999	10,604	13.3
20,000 » 99,999	10,388	13.1
100,000 » 199,999	4,577	5.8
200,000 » 499,999	5,757	7.2
500,000 » 999,999	5,873	7.4
1,000,000 and more	7,981	10.1
	79,375	100,0

Belgium.

No generally applicable definition of the concept of urban and rural population is known to Belgian statistics. The reason for this can be readily understood. The economic structure, the distribution and the density of the population make it very difficult to draw a dividing line between urban and rural area. For the study of various social problems the classification of the communities by the density and occupational structure of the population has been used.

Since the census of 1858 the communities have been classified into six size groups. The two lowest groups are those with less than 2,000 and those with 2,000 and up to 5,000 inhabitants. For the purposes of many inquiries communities with a population not exceeding 5,000 inhabitants are classed as rural. It may be allowed that at the time of the 1856 census and for decades later these communities were definitely rural in character, but this is now no longer the case, to judge by the density and occupational structure of the population, at least in most cases. Thus in 1932 only 40.76 per cent. of the occupied population in the communities with less than 2,000 inhabitants was engaged in agriculture and forestry, and in those with 2,000 and not more than 5,000 inhabitants only 27.72 per cent. were thus employed. In communities with 5,000 and not more than 20,000 the percentage fell to 12.27 per cent. and to 2.64 per cent. in those with 20,000 but not more than 50,000 inhabitants. *Vice versa*, of the total number engaged in agriculture and forestry 45.14 per cent. were recorded by the census as residing in communities with less than 2,000 inhabitants, and only 31.62 per cent. in communities with 2,000 and not more than 5,000 inhabitants, 19.9 per cent. in communities with 5,000 and not more than 20,000 inhabitants, and the remaining 3.44 per cent. in the more populous communities.

Table 13 gives the percentages both for the communities with over 2,000 and for those with over 5,000 inhabitants. In both sets of figures urbanization has steadily increased since 1856. In 1930 80 per cent. of the total population resided in com-

munities with 2,000 and more inhabitants, 60.5 per cent. in those with 5,000 and more. Unlike other industrial countries, the small and medium sized towns are those of most importance. In 1930 of the total population only 11.6 per cent. lived in cities with 100,000 and more inhabitants, as against 14.6 per cent. in communities with 5,000 to 10,000, 17 per cent. in communities with 10,000 to 25,000, 17.3 per cent. in communities with 25,000 to 100,000 inhabitants.

France.

The French census statistics, besides grouping the communities according to the number of inhabitants, also divide the population into rural and urban. This latter division has been made in all the censuses taken since 1846, so that we possess comparable figures for a long series of years. The population of all communities with more than 2,000 inhabitants in the chief residential centre are classed as urban; that of all the other communities as rural.

The ratio of the urban to total population has been steadily rising; since 1846, when it stood at 24.4 per cent., it had risen to 31.1 per cent. in 1872, to 40.9 per cent. in 1901, to 51.2 per cent. in 1931, and to 52.4 per cent. in 1936 (see Table 2). In absolute figures the urban population has risen from 8.6 millions in 1846 to 22 millions in 1936.

TABLE 2. — France: *Rural and urban population from 1846 to 1936.*

Year	Total population in thousands	Rural population		Urban population	
		thousands	%	thousands	%
1846 (86 Dep.)	35,402	26,755	*75.6*	8,647	*24.4*
1851 » »	35,783	26,648	*74.5*	9,135	*25.5*
1856 » »	36,039	26,195	*72.7*	9,845	*27.3*
1861 (89 Dep.)	37,386	26,597	*71.1*	10,790	*28.9*
1866 » »	38,067	26,472	*69.5*	11,595	*30.5*
1872 (87 Dep.)	36,103	24,868	*68.9*	11,235	*31.1*
1876 » »	36,906	24,928	*67.5*	11,977	*32.5*
1881 » »	37,672	24,576	*65.2*	13,097	*34.8*
1886 » »	38,219	24,452	*64.1*	13,767	*35.9*
1891 » »	38,343	24,032	*62.6*	14,311	*37.4*
1896 » »	38,517	23,492	*60.9*	15,026	*39.1*
1901 » »	38,962	23,005	*59.1*	15,957	*40.9*
1906 » »	39,252	22,715	*57.9*	16,537	*42.1*
1911 » »	39,605	22,096	*55.8*	17,509	*44.2*
1921 » »	37,500	20,119	*53.7*	17,380	*46.3*
1921 (90 Dep.)	39,210	21,004	*53.6*	18,205	*46.4*
1926 » »	40,744	20,759	*50.9*	19,985	*49.1*
1931 » »	41,835	20,414	*48.8*	21,421	*51.2*
1936 » »	41,907	19,935	*47.6*	21,972	*52.4*

Until 1851 the rural population in almost all the *départements* increased in numbers; from then until 1876 it remained fairly stationary. Since then a steady decline set in, which continued until the last census. In 1936 the number

stood at 19.9 millions as against 26.8 millions in 1846. The progress, extent and cause of the decline of the rural population have been the subject of more enquiries in France than in any other country. They show that the migration from the country to the town is not the only cause of the decline in the number of the rural population, but that it is also due to the low rural birth-rate. This latter in many parts of France, unlike other countries, is even lower than in the urban districts. A small migration from the country to the towns has thus sufficed to cause a sensible decline in the number of the rural population. If the decline has not been even greater, this was due to the large influx of foreign immigrants in the rural districts.

A glance at the movement of the population in the communities belonging to the several size groups shows that while the population in communities with not more than 2,000 inhabitants has declined, that of the small, medium-sized and larger communities has increased. In the period running from 1866 to 1931 the population of the communities rose as follows:

in communities with	5,001 to	20,000	inhabitants	by 2,519,000	inhabitants
» » »	20,001 »	50,000	»	» 1,975,000	»
» » »	50,001 »	100,000	»	» 1,819,000	»
» » »	100,001 »	400,000	»	» 1,001,000	»
» » »	400,001 »	1,000,000	»	» 1,381,000	»
» » »	over	1,000,000	»	» 1,066,000	»

The population was distributed in 1931 between the communities belonging to the several size groups as follows:

Communities with . . . inhabitants	Population thousands	%
less than 1,000	11,508	*27.5*
1,001 to 2,000	5,649	*13.6*
2,001 » 5,000	5,621	*13.4*
5,001 » 10,000	3,024	*7.2*
10,001 » 20,000	3,133	*7.5*
20,001 » 50,000	3,511	*8.4*
50,001 » 100,000	2,805	*6.7*
100,001 and more	6,586	*15.7*
	41,835	*100.0*

Great Britain.

The division of the population into urban and rural is based on the administrative classification into urban and rural districts.

Owing to the earlier industrialization of the country, urbanization began in *England* and *Wales* much earlier than in other parts of Europe. At the close of the XVIIIth century the migration from country to town was already complained about. While in some rural districts a decline of the population was noted as

early as the first decade of the XIXth century, yet the total rural population increased until the second half of the century. At the time of the 1851 census, the first for which figures are available, the urban and rural population were nearly equal, in round figures 9 millions and 8.9 millions (see Table 3). At the next census taken in 1861, the figure for the urban population was approximately 11 millions and was already notably in excess of that for the rural population which numbered 9.1 millions. The next decennial census showed a rapidly growing urban population, while the rural population was slowly but steadily declining from decade to decade. In 1931 an urban population of 31.9 millions stood against a rural population of only 8 millions. The ratio of the rural to total population had fallen from 49.8 per cent. in 1851 to 20 per cent. in 1931.

TABLE 3. — Great Britain and North Ireland: *Rural and urban population from 1851 to 1937.*

Year	Total population in thousands	of which in			
		rural districts		urban districts	
		thousands	%	thousands	%
		England and Wales			
1851	17,928	8,937	49.8	8,991	50.2
1861	20,066	9,105	45.4	10,961	54.6
1871	22,712	8,671	38.2	14,041	61.7
1881	25,974	8,338	32.1	17,637	67.9
1891	29,003	8,107	28.0	20,896	72.0
1901	32,528	7,469	23.0	25,058	77.0
1911	36,070	7,908	21.9	28,163	78.1
1921	37,887	7,851	20.7	30,035	79.3
1931	39,952	8,000	20.0	31,948	80.0
		Scotland			
1861	3,062	1,296	42.3	1,767	57.7
1891	4,026	1,184	29.4	2,841	70.6
1911	4,761	1,170	24.6	3,591	75.4
1921	4,882	1,111	22.7	3,772	77.3
1931	4,843	963	19.9	3,880	80.1
		North Ireland			
1901	1,237	706	57.1	531	42.9
1911	1,251	664	53.1	587	46.9
1926	1,257	619	49.2	638	50.8
1937	1,280	602	47.1	678	52.9

The progress of urbanization has however slowed down considerably since the turn of the century. Nevertheless the tendency of the population to crowd into the large cities to which the flow of migration from the country was mainly directed, has continued unabated. In 1800 there was only one city (London with 959,000 inhabitants) which exceeded the hundred thousand limit. Since than

the number of such cities in England and Wales increased to eight in 1850, twenty in 1880, thirty-two in 1902, forty-two in 1910, forty-five in 1920, and fifty-one in 1930. In 1931 45.22 per cent. of the entire population of England and Wales lived in the large cities.

The development in *Scotland* was similar to that in England and Wales. The number of large cities grew in that country from two in 1850 to four in 1931, when they accounted for 38.6 of the total population.

Ireland.

The development of the urban population (administrative definition) in Ireland differs from that noted in other countries, for special and well-known reasons. The total population of the present Ireland has declined steadily from a maximum of 6,529, 000 inhabitants, at which it stood in 1841, to 2,968,000 recorded in 1936. Since the turn of the century, and more especially since the constitution of the Free State, the rate of decline has been noticeably slower. In 1841 the urban population numbered 1,092,000 persons (16.7 per cent. of the total population), in 1891 it had fallen to 879,000 (25.3 per cent. of total population), since when it slowly rose to 944,000 (31.8 per cent.) in 1926. The figures for 1936 are not before us. Since 1941 the rural population has steadily declined, from 5,437,000 (83.3 per cent. of total population) it had fallen to 2,028,000 (68.2 per cent. of total) in 1926.

Italy.

Official Italian statistics draw no distinction between urban and rural population. In the census, however, a classification of the communities by the number of their inhabitants has been undertaken. In the 1921 census a classification of *agglomerated* and *scattered* population was first made. Agglomerated population is that in a centre provided at least with one public institution such as a church, school, railway station or public building, etc.

The 1936 census, moreover, classified the communities in four groups based on the ratio of persons occupied in agriculture and forestry to the total population of the community: (1) communities with a ratio of less that 25 per cent., (2) districts with a ratio of 25 to 49.9 per cent., (3) communities with a ratio of 50 to 74.9 per cent., and (4) those with more than 75 per cent. occupied in agriculture and forestry. The distribution of the communities and of the total population into these 4 groups was as follows:

Group	Number of communities	Population thousands	%
(1) (less than 25 per cent.)	504	12,000	27.9
(2) (25-49,9 per cent.)	1,042	7,184	16.7
(3) (50-74,9 per cent.)	2,793	14,573	33.9
(4) (75 per cent. and more)	3,000	9,237	21.5
	7,339	42,994	100.0

As such returns showing the rural character of the communities were not made in previous censuses, in considering the development one must go back to the division of the communities by the number of population. Several writers, among whom Corrado GINI, propose a population of not more than 10,000 as the upper limit for a rural community. This at first sight would appear to be a very high figure. It is however justified by the fact that Italian communities generally comprise several centres; thus in 1936 the number of communities stood at 7,339 as compared to 27,240 " centres ". The average territorial extension of a community is therefore large as compared to those of other countries. In 1936 it stood at 4,226 hectares as compared, for instance, to 1,450 hectares, in France (1931), 1,142 hectares in Belgium (1933) and only 921 hectares in Germany (1933).

A further justification of the upper limit proposed is found in the fact that in many parts of Italy, more especially in the South and in Sicily, there are communities with a population of 20, 30 and even 50 thousand and more inhabitants which are of a definitely rural character. Thus there is a compensation for the communities below the 10,000 inhabitants limit which are urban in character.

TABLE 4. — Italy: *Rural and urban population from 1881 to 1936.*

Year	Total population (1) in thousands	of which in communities up to 10,000 inhabitants: thousands	%	with over 10,000 inhab.: thousands	%
1881	28,460	18,606	*65.4*	9,854	*34.6*
1901	32,475	19,461	*59.9*	13,014	*40.1*
1911	34,671	19,437	*56.1*	15,235	*43.9*
1921	37,974	20,772	*54.7*	17,202	*45.3*
1931	41,177	20,350	*49.4*	20,826	*50.6*
1936	42,919	20,541	*47.9*	22,378	*52.1*

(1) 1881-1931: Population present.— 1936: Population present or absent in Italian East Africa, the Italian colonies and possessions.

If work in agriculture and forestry is considered as the principal criterion for determining the rural character of a population, then it should be noted that in 1936, 47.9 per cent. of the total population dwelt in communities with not more than 10,000 inhabitants, while the ratio of persons occupied in agriculture and forestry to the total occupied population stood at 48.2 per cent. An upper limit of 5,000 inhabitants for classifying communities as rural would be decidedly too low, as in Italy in 1936 only 28.9 per cent. of the total population dwelt in such communities.

Table 4 shows the classification in urban and rural population for the censuses taken since 1881. According to that table, almost the whole increase of the population since 1881 has been absorbed by the urban communities; their population has risen from 9.9 millions to 22.4 millions, whereas that of the rural communities has risen from 18.6 to 20.5 millions (leaving out of account changes due to the modification of the frontiers).

TABLE 5. — Italy: *Distribution of the population according to the size of communities in 1931 and 1936.*

Communities with . . . inhabitants	1931 (1)		1936 (2)	
	thousands	%	thousands	%
less than 1,000	577	*1.4*	568	*1.3*
1,001– 2,000	2,560	*6.2*	2,506	*5.8*
2,001– 5,000	9,253	*22.5*	9,333	*21.8*
5,001– 10,000	7,960	*19.3*	8,133	*19.0*
10,001– 20,000	5,779	*14.0*	6,103	*14.2*
20,001– 50,000	5,174	*12.6*	5,198	*12.1*
50,001–100,000	2,702	*6.6*	3,118	*7.3*
100,000 and more	7,172	*17.4*	7,960	*18.5*
Total . . .	41,177	*100.0*	42,919	*100.0*

(1) Population present.
(2) Population present or absent in Italian East Africa, the Italian colonies and possessions.

The ratio of urban to total population has risen from 34.6 per cent. in 1881 to 40.1 per cent. in 1901, and 45.3 per cent. in 1921. In the period 1921-31 urbanization was more rapid and was closely connected with general expansion; subsequently, as a result of the economic depression, the rate again diminished.

These changes, apart from migrations, have been due to the fact that numerous communities have passed the 10,000 limit as a result of the natural growth of their population. The number of communities also changed considerably in the course of time. By the dissolution of numerous small communities and their incorporation with others the total number of communities was reduced from 9,196 in 1921 to 7,339 in 1936. The comparability of the figures was thus greatly restricted.

The relative decline of the rural population corresponded in the period 1921-1936, to an absolute decline of the population in communities with not more than 5.000 inhabitants. In the group with 5,001 to 10,000 inhabitants there was also a relative decline though the actual number of the population increased somewhat. In all the communities with more than 10,000 inhabi-

tants the population increased both relatively and absolutely. In both respects the increase was most marked for the cities with more than 100,000 inhabitants (see Table 5).

The Netherlands.

In the Netherlands, as in Belgium, the division of the population into urban and rural is difficult. For density of population the Netherlands, with 227 per sq. km. (1930), ranks second in Europe after Belgium (265 per sq. km. in 1930). The ratio of persons engaged in agriculture and forestry to the total number of occupied persons is 20.1 per cent. (1930), higher than in Belgium (16.9 per cent. in 1930), but is rather low compared to other European countries. The ratio of the population of communities with not more than 50,000 inhabitants to the total population, the same as in Belgium, is rather high, but the ratio of communities with 50 to 100,000 inhabitants and of those with 100,000 and more is noticeably higher than in Belgium. In 1930 the population of the large cities accounted for 27.2 per cent. of the population in the Netherlands as against 22.6 per cent. in Belgium.

Denmark, Norway and Sweden.

In Denmark, Norway and Sweden the official statistics divide the population into urban and rural on the basis of the administrative status of the communities.

In all three countries the development can be followed since 1850. As shown in Table 13, the urban population has slowly but steadily increased. Its ratio to the total population stood in 1930 at 28.5 per cent. in Norway, 32.5 per cent. in Sweden, and 43.9 per cent. in Denmark.

A classification of the population based on the size of communities, shows that the smaller communities are the more important. The latest census returns show that the communities with not more than 10,000 inhabitants accounted for 76.8 per cent. of the population in Norway, 71.6 per cent. in Sweden, and 58.5 per cent. in Denmark. The percentage for the medium-sized communities is low. The population of the large cities is concentrated mostly in the capitals. In 1930 the following cities exceeded the 100,000 limit: in Denmark, Copenhagen (including the suburbs, 771,000 inhabitants), in Norway, Oslo (253,000), in Sweden, Stockholm (including the suburbs, 605,000), Göteborg (243,000) and Malmö (128,000).

From 1850 to 1935 the population of Denmark increased by some 2.3 millions of whom 713,500 were absorbed by Copenhagen and its suburbs which account for 22.7 per cent. of the total population. In both the other countries the ratio of the population of the large cities to total population is much lower (see Table 14). From all points of view the urbanization has developed most in Denmark, a fact which is accounted for by the greater density of the population and by the economic structure of the country.

Union of Socialist Soviet Republics.

In the last two decades planned industrialization has led to a great increase of the urban population. The division of the population into urban and rural (administrative definition) has developed, within the frontiers at the time of the 1939 census, as follows:

Year	Urban	Rural	Total
1897: thousands	15,826	90,607	106,432
%	*14.9*	*85.1*	*100.0*
1926: thousands	26,314	120,714	147,028
%	*17.9*	*82.1*	*100.0*
1939: thousands	55,910	114,557	170,467
%	*32.8*	*67.2*	*100.0*

According to these figures, the urban population more than doubled in the period 1926-1939. Its ratio to the total population had risen from 17.6 per cent. to 32.8 per cent. The increase was due partly to the natural increase of the population and to the passage of numerous rural communities to the urban class, but above all to large internal migrations. The total loss of rural population caused by the migrations in the period intervening between the 1926 and the 1939 census is estimated at 18.5 millions. As the natural increase of the rural population was less than that, the total rural population declined by some 6,157,000 units, i. e. 5.1 per cent.

How rapidly urbanization took place is also shown by the fact that the number of cities with 100,000 and more inhabitants rose from 31 in 1926 to 82 in 1939. In that year 16 per cent. of the total population dwelt in such cities as compared to 6.5 per cent. in 1926. In 1939 34,025,000 persons resided in towns with more than 50,000 inhabitants, as against 13,986,000 in 1926.

Canada.

From the first decennial census taken in 1871 down to the seventh taken in 1931 the same distinction has been made between rural and urban population The total population of cities, towns and villages incorporated under the laws of the various provinces and Yukon is regarded as urban, while the rural includes all the remainder of the population.

The urban population as thus defined rose from 722,343 in 1871 to 5,572,058 in 1931, thus increasing nearly eightfold (7.7); the rural population in the same period rose from 2,966,914 to 4,804,728 or 1.6 times. The ratio of rural to total population thus fell from 80.4 per cent. to 46.3 per cent. (see Table 6).

The movement of population differed widely in the several provinces. From 1901 to 1931 the total rural population increased 43 per cent. More than 80 per cent. of this increase belonged to the Prairie provinces, 15 per cent. to British Columbia, and only 5 per cent. to the other provinces.

The ratio of the population of the large cities to total urban population rose from one census to another. The number of large cities rose from 2 in 1900 to 7, accounting for 22.4 per cent. of the total population in 1930.

TABLE 6. — Canada: *Rural and urban population from 1871 to 1931.*

Year	Total population in thousands	Rural population		Urban population	
		thousands	%	thousands	%
1871	3,689	2,967	*80.4*	722	*19.6*
1881	4,325	3,215	*74.4*	1,110	*25.6*
1891	4,833	3,296	*68.2*	1,537	*31.8*
1901	5,371	3,357	*62.5*	2,014	*37.5*
1911	7,207	3,934	*54.6*	3,273	*45.4*
1921	8,788	4,436	*50.5*	4,352	*49.5*
1931	10,377	4,805	*46.3*	5,572	*53.7*

United States of America.

The classification of the population as urban or rural is based on the division of the country into urban and rural districts. All cities and other incorporated places having 2,500 inhabitants or more are considered urban districts. In the 1920 and 1930 censuses the rural population is moreover classified in rural non-farm and rural farm.

TABLE 7. — United States: *Rural and urban population from 1820 to 1935.*

Year	Total population in thousands	Rural population		Urban population	
		thousands	%	thousands	%
1820	9,638	8,961	*93.0*	677	*7.0*
1830	12,866	11,781	*91.6*	1,085	*8.4*
1840	17,069	15,096	*88.4*	1,973	*11.6*
1850	23,192	19,291	*83.2*	3,901	*16.8*
1860	31,443	24.912	*79.2*	6,531	*20.8*
1870	38,558	28,464	*73.8*	10,095	*26.2*
1880	50,156	35,845	*71.5*	14,311	*28.5*
1890	62,948	40,718	*64.7*	22,230	*35.3*
1900	75,995	45,698	*60.1*	30,296	*39.9*
1910	91,972	49,873	*54.2*	42,099	*45.8*
1920	105,711	51,354	*48.6*	54,356	*51.4*
1930	122,775	53,820	*43.8*	68,955	*56.2*
1935 (1)	127,152	54,832	*43.1*	72,320	*56.9*

(1) Estimated.

Source: 1820-1930 – THOMPSON and WHELPTON: Population Trends in the United States. New York and London, 1933, p. 20; 1935 – Statistical Abstract of the United States. 1938, p. 582.

The growth of the population of the United States depended, until late in the second half of last century, first and foremost on the development of agriculture. The ratio of rural to total population has therefore declined only slowly; in 1850 it still stood at 83.2 per cent. From the middle of the XIXth century the rate of urbanization began to increase. The censuses of 1860 and 1870 showed that the increase of population was already equally divided between urban and rural districts. In the following decade the increase of population was progressively concentrated in the urban districts. Table 7 shows this development since 1820.

The evolution was characterised by the increasingly rapid growth of the population of the large cities. In 1800 only one city, New York, exceeded the 100,000 limit; in 1850 there were already seven such cities; in 1880 their number rose to twenty, in 1900 to thirty-seven, in 1920 to sixty-eight, and in 1930 to ninety-three. Moreover, the bigger the city, the larger the rate of increase. In 1850 2.2 per cent. of the population dwelt in cities of over 250,000 inhabitants, in 1870 this ratio had already risen to 7.4 per cent., in 1890 to 11 per cent., in 1900 to 14.5 per cent., in 1920 to 19.8 per cent., and in 1930 to 23.5 per cent. The cities with a million inhabitants and more accounted in 1900 for 8.5 per cent. of the population, in 1920 for 9.6 per cent. and in 1930 for 12.3 per cent.

Argentina.

In Argentina, generally considered as an essentially agricultural country, urbanization has also been very marked. In the case of this country we follow A. E. Bunge [1] in considering the population in centres with 1,000 and more inhabitants as urban.

Table 8, which we take from the work of the above mentioned writer, shows that the urban population of Argentina increased sixteen-fold in the period comprised between 1869 to 1938, whereas the rural population only doubled. The ratio of urban to total population rose from 33 per cent. in 1869 to 74 per cent. in 1938, and the ratio of rural population fell from 67 per cent. to 26 per cent. In the last decade the actual number of the rural population has also declined. According to an estimate (censuses were only taken in 1869, 1895, and 1914), in 1938 the figure for the rural population stood at 3,320,000 as compared to 3,580,000 in 1930. If we include the population of centres with 1 to 2 thousand inhabitants in the rural population, the figures are only slightly modified. The percentage of the population living in the open country or in centres with less than 2,000 inhabitants to total population stood at 71.72 per cent. in 1869, 62.61 per cent. in 1895, 47.26 per cent. in 1914 and 30 per cent. in 1938.

About one half of the urban population lives in large cities. At the beginning of 1937 no fewer than 2,993,000 persons, i. e. 23.8 per cent. of the total population

(1) BUNGE, Alejandro E.: La agrícola Argentina, país de población urbana. In: *Revista de Economia Argentina*, December 1938.

(12,561,361), were living in Greater Buenos Aires (city and suburbs, including Avellaneda), while Greater Buenos Aires and the other six cities with 100,000 and more inhabitants accounted for 4,385,000 inhabitants or 35 per cent. of the total population.

Table 8. — Argentina: *Rural and urban population from 1869 to 1938.*

Year	Total population in thousands	Rural population		Urban population	
		thousands	%	thousands	%
1869 (1)	1,737	1,164	67	573	33
1895 (1)	3,955	2,294	58	1,661	42
1914 (1)	7,885	3,312	42	4,573	58
1930 (2)	11,188	3,580	32	7,608	68
1938 (2)	12,760	3,320	26	9,440	74

(1) Census returns.
(2) Estimated.

Source: BUNGE, Alejandro E.: La agrícola Argentina, país de población urbana. In: *Revista de Economía Argentina*, December 1938.

At first sight this advanced stage of urbanization may seem inexplicable, but it is readily accounted for by the history of the colonization of the country and by the structure of Argentinian agriculture which is characterised by vast expanses of prairie land, large fertile areas, favourable climatic conditions, and extensive methods of cultivation with large numbers of cattle and the use of machinery on a large scale. The number of agricultural workers required—and they always form the major portion of the rural population — is relatively small. This is clearly shown by the following figures which we take from the study made by A. E. Bunge: 10,000 head of cattle raised for their meat and hides can be cared for in Argentina by 15 to 20 men, but as such a number of cattle comprises on the average 850 milch cows, the number of men required may reach 30 to 35. In Europe, on the other hand, 10,000 head of cattle require nearly fifty times that number of men to care for it. Similarly, the number of men required to look after 100,000 sheep (including shearing) in Argentina is reckoned at 100 to 200; in Western Europe four times that number would be required. The differences are also very striking in the case of the labour required for the production of Argentina's staple crops. Thus is the case of wheat, three or four persons suffice for the cultivation of 200 acres of land. The high productivity of human labour in the production of important consumption goods may doubtless be welcome, but its consequences, as reflected in the relative and absolute reduction of the rural population, have been followed in Argentina as well for some years past not without serious apprehension.

Union of South Africa.

The ratio of the urban to the total population (administrative definition) has steadily risen along with industrial development. Whereas in 1891 only 35 per cent. of the population of European origin dwelt in the urban areas, the ratio stood at 65.24 per cent. in 1936. This is partly accounted for by the expansion of the urban districts, but first and foremost by the migration from the rural districts and by foreign immigration. The great mass of the non-European population lives in rural districts, including the native reservations; but in their case also, with the expansion of mining and manufacturing industries, the urban ratio rose in the period 1921-1936 from 16.42 per cent. to 22.44 per cent. (see Table 9).

TABLE 9. — Union of South Africa: *Urban and rural population from 1891 to 1936.*

Year	Total population in thousands	Rural population		Urban population	
		thousands	%	thousands	%
		European population			
1891	621	403	*65.0*	217	*35.0*
1904	1,117	526	*47.0*	591	*52.9*
1911	1,276	618	*48.3*	658	*51.7*
1918	1,422	655	*46.1*	767	*53.9*
1921	1,519	672	*44.2*	848	*55.8*
1926	1,677	701	*41.8*	976	*58.2*
1931	1,828	708	*38.8*	1,120	*61.2*
1936	2,004	696	*34.8*	1,307	*65.2*
		Non-European population			
1904	4,059	3,450	*85.0*	609	*15.0*
1911	4,697	3,878	*82.6*	820	*17.5*
1921	5,409	4,521	*83.6*	888	*16.4*
1936	7,586	5,884	*77.6*	1,702	*22.4*
		Total population			
1904	5,176	3,976	*77.8*	1,200	*23.2*
1911	5,973	4,496	*75.3*	1,478	*24.7*
1921	6,929	5,193	*74.9*	1,736	*25.1*
1936	9,590	6,580	*68.6*	3,010	*31.4*

In 1936, 6.5 per cent. of the European population resided in cities of 100,000 to 250,000 inhabitants, 13.4 per cent. in cities of 250,000 to 500,000, and 12.91 per cent. in cities of 500,000 and more, so that approximately one third of the European population dwelt in large cities.

Australia.

In the census returns the population is classified as urban (that of the State capitals and of the provincial urban districts), rural, and migratory. Persons residing in the urban districts surrounding the State capitals are reckoned in with their population. All persons who throughout the census night are on board ships in Australian ports or are travelling on long distance trains are counted as migratory.

The concentration of the population in the large cities has developed in Australia in a few decades to an unparalleled extent. This is due only to a small extent to natural conditions, the explanation must be sought first of all in the history of colonization by the white population and in the economic policy of the country.

It is estimated that in 1891 two thirds of the Australian population dwelt in rural districts; in 1933 the proportion had fallen to one third. Yet in actual figures the rural population increased steadily (see Table 10).

TABLE 10. — Australia: *Urban and rural population 1921 and 1933.*

Urban or rural population	1921		1933	
	thousands	%	thousands	%
Urban:				
metropolitan	2,338	*43.0*	3,107	*46.9*
provincial	1,037	*19.1*	1,125	*17.0*
Rural	2,030	*37.4*	2,381	*35.9*
Migratory	30	*0.5*	17	*0.2*
Total	5,436	*100.0*	6,630	*100.0*

The urban population is concentrated in a few large towns; the density of the population in the surrounding rural districts is very low. The number of medium-sized towns is small. In 1933 no less than 46.9 of the total population dwelt in the capital cities. The population of the several capital cities and their adjoining urban municipal areas and its ratio to the total population of the respective States were as follows:

Sydney	1,235,267	inhabitants	= 47.5 per cent. of the population of	New South Wales
Melbourne	991,934	»	= 54.5 » » » » » »	Victoria
Adelaide	312,619	»	= 53.8 » » » » » »	South Australia
Brisbane	299,748	»	= 31.6 » » » » » »	Queensland
Perth	207,440	»	= 47.3 » » » » » »	West Australia
Hobart	60,406	»	= 26.5 » » » » » »	Tasmania
	3,107,414	»	= 46.9 » » » » » »	Australia

New Zealand.

Since 1881 the ratio of the urban to the total population (administrative definition) has steadily risen in New Zealand and in 1936 it stood at 59.3 per cent. of the total population exclusive of the Maoris (see Table 11). Approximately 52 per cent. of the population dwelt, in 1936, in the four major urban districts (Auckland with 210,393 inhabitants, Wellington with 149,382, Christchurch with 132,282, Dunedin with 81,848).

As we see urbanization has also made considerable progress in New Zealand, but it has not the extreme features it has acquired in Australia. Side by side with the four large cities above mentioned, only one of which has exceeded the 200,000 limit, there are many smaller important centres.

TABLE 11. — New Zealand: *Rural and urban population from 1881 to 1936.*

Year	Total popolation (1) in thousands	Rural population		Urban population	
		thousands	%	thousands	%
Excluding Maoris					
1881	490	292	*59.6*	195	*39.8*
1891	627	353	*56.3*	270	*43.1*
1901	773	419	*54.2*	350	*45.3*
1911	1,008	498	*49.4*	505	*50.1*
1921	1,219	532	*43.6*	682	*56.0*
1926	1,344	552	*41.1*	785	*58.4*
1936	1,491	603	*40.4*	884	*59.3*
Including Maoris					
1926	1,408	610	*43.4*	791	*56.1*
1936	1,574	677	*43.0*	892	*56.7*

(1) The difference between the total population and the sum of rural and urban population = migratory population.

Japan.

The Japanese Bureau of Statistics classifies the communities in 11 size groups according to the number of inhabitants. For classifying the communities as urban or rural several definitions have been proposed. We have followed that of Ryoichi ISHII (1) which fixed 10,000 inhabitants as the dividing line. The figures quoted are taken partly from Ryoichi Ishii's book and partly from official Japanese statistics.

(1) ISHII, Ryoichi: Population Pressure and Economic Life in Japan, London, 1937.

If we consider rural the population of the communities with less than 10,000 inhabitants, the rural population of Japan still accounted for 84 per cent. of the total population in 1893. Of the remaining population only 6 per cent. dwelt in cities with over 100,000 inhabitants. In the following decades, with the expansion of trade and industry, the ratio of the rural population declined with each successive census. The urban population became more and more agglomerated in the large cities. In 1893 they accounted for 6 per cent. of the total population, for 9.2 per cent. in 1903, for 12.1 per cent. in 1920, for 17.8 per cent. in 1930, for 25.3 per cent. in 1935 and in 1940, according to the census returns so far available, for 29 per cent. (see Table 12).

TABLE 12. — Japan: *Distribution of the population by size of communities 1920, 1925, 1930, and 1936.*

Groups of communities by number of inhabitants	1920	1925	1930	1936
	Population present in thousands			
1– 499	36	26	22	19
500– 999	241	213	207	201
1,000– 1,999	3,759	3,636	3,337	3,207
2,000– 4,999	23,070	22,534	22,120	21,137
5,000– 9,000	10,821	11,475	12,472	12,938
10,000–19,999	5,074	5,229	5,718	6,255
20,000–29,999	1,807	1,807	2,205	2,065
30,000–39,999	1,407	1,249	1,293	1,489
40,000–40,999	889	1,381	1,192	740
50,000–99,999	2,105	3,445	4,402	3,685
100,000 and more	6,754	8,741	11,481	17,518
Totals	55,963	59,737	64,450	69,254

Thus in an exceptionally short time, the concentration of population in large cities in Japan has risen to the level attained in Western countries. There were 6 large cities in 1893, 16 in 1920, 32 in 1930 and 45 in 1940.

In the period 1893-1935 the population of Japan increased by 27.2 millions and of this number only 12.2 millions were accounted for by communities with less than 10,000 inhabitants, as compared to 15 millions absorbed by the more populous communities.

Summary.

LARGE ABSOLUTE AND RELATIVE INCREASE IN THE URBAN POPULATION IN ALL PROGRESSIVE COUNTRIES.

Since the middle of last century urbanization has steadily gained ground in all the more advanced countries, often at an exceedingly rapid rate.

Table 13 brings together the figures for this development in a great number of countries.

As the compilation is based on the classifications used in the several countries, and as these classifications are made on different principles, the figures are of unequal value and make direct comparisons impossible. Even when the classification is based on the same principle, comparability is limited, as the mode of settlement of the population and economic structure differ widely from country to country as do also the type and area of the communities. The table therefore can only indicate the general trend.

In *Great Britain* the migration from country to town had already begun to assume large proportions at the close of the XVIIIth century. Both in industrialization and in urbanization Great Britain was ahead of the other European countries. In the second half of the last century, urbanization spread to the other parts of Europe, and with the advance and expansion of industrialization it gained ground rapidly in different countries, such as *Germany*, *Belgium*, *the Netherlands*, *France*, *Italy*, and *Switzerland*. With even greater vigour than in Europe, urbanization developed in the so-called new countries. This was the case in the *United States*, *Canada*, and *Argentina*, as also in *Australia* and *New Zealand*. The latest development of urbanization is seen in the *U. S. S. R.*, where in the brief space of 13 years (1926-1929) the ratio of urban to total population has risen from 18 to 33 per cent.

Nor is urbanization a phenomenon confined to the Western World. We find it also in Asiatic countries, that is everywhere where European technical methods and modern industrial organization have been adopted. But only in one Asiatic country has it so far acquired greater importance as regards its rate, its extent and the problems to which it gives rise, and that is in *Japan*. Urbanization on a large scale began in Japan with the turn of the century, and the movement has acquired extraordinary momentum in the last two decades.

Urbanization has everywhere developed along with the transformation of the national economy. Generally speaking the swifter and more fundamental the change, the more rapid has been the rate of urbanization. Accordingly it, was slow where the expansion of industry and trade is still in its initial stages, as in the agricultural countries of South-Eastern Europe.

In many countries the rural population has declined in absolute numbers.

Urbanization may be accompanied by the increase, stationary condition, or decline of the rural population; by which of these three will depend on the factors which determine the rate of natural increase and the migratory movements of the population. When the progress of urbanization is fed exclusively by internal migrations, the numerical evolution of the rural population will depend not only on the rate of urbanization, but also on the rural birth rate. When the ratio of urban to total population has become very high, its maintenance and, still more, its further growth will depend on a large influx of migrants. If the rural birth-rate has fallen to a low level, then the migration of even small numbers to the towns and cities will suffice to cause an absolute decrease of the rural population.

TABLE 13. — *The evolution of the ratio*

Countries (1)	Definition of urban population (*in italics if that used in the official statistics*)
Germany:	*Popul. of the communities with 2,000 and more inhab.*
a) Former territory	. . . .
b) Territory 1st January 1938	. . . .
Belgium	a) Popul. of the communities with 2,000 and more inhabitants . . . . b) Popul. of the communities with 5,000 and more inhabitants . . . .
Denmark	*Division into urban and rural communities according to administrative status* . . . .
France	*Popul. of the communities in which the agglomerated population of the chief residential centre has more than 2,000 inhabitants* . . . .
Greece	By number of inhabitants, classification in: (1) towns (5,001 and more); (2) small towns (2,001 = 5,000); (3) villages (under 2,001). Inhab. of 1 + 2 = urban population . . .
Ireland	*Population of towns and cities* . . . .
Italy	Popul. of communities with over 10,000 inhab.
Norway	*Division into urban and rural communities according to administrative status* . . . .
The Netherlands	Popul. of communities with more than 5,000 inhab.
United Kingdom of Great Britain and North Ireland:	*Division in urban and rural districts according to administrative status.*
a) England and Wales	. . . .
b) Scotland	. . . .
c) North Ireland	. . . .

(1) Territory of the countries at the date of the census, unless otherwise noted. Countries arranged by continents and in French alphabetical order.

(2) The figures given are those of the censuses of the following years:
Germany: 1871, 1880, 1890, 1900, 1910, 1925, 1933, 1939;
Belgium: 1856, 1866, 1880, 1890, 1900, 1910, 1920, 1930;
Denmark: 1850, 1860, 1870, 1880, 1890, 1901, 1911, 1921, 1930, 1935;
France: 1851, 1861, 1872, 1881, 1891, 1901, 1911, 1921, 1931, 9136;
Greece: 1879, 1889, 1896, 1907, 1920, 1928.

of urban to total population.

Urban population in percent of total population according to the census nearest the year (2):									
1850	1860	1870	1880	1890	1900	1910	1920	1930	1935 or later
—	—	36.1	41.4	47.0	54.4	60.0	—	—	—
—	—	—	—	—	—	61.7	64.6	67.2	69.9
—	61.4	63.6	68.4	71.4	75.1	77.7	77.9	80.5	—
—	34.8	36.3	43.0	46.2	52.3	56.5	57.3	60.5	—
20.9	23.4	24.8	28.0	33.2	38.2	40.3	43.2	43.9	46.1
25.5	28.9	31.1	34.8	37.4	40.9	44.2	46.4	51.2	52.4
—	—	—	28.0	30.0	31.0	33.0	36.0	42.0	—
22.0	22.2	22.8	23.9	25.3	28.0	29.7	—	31.8	—
—	—	—	34.6	—	40.1	43.9	45.2	50.6	52.1
13.3	15.6	18.3	—	23.7	28.0	28.8	29.6	28.5	—
66.1	67.0	67.7	69.2	71.5	74.0	75.8	77.3	78.7	—
50.2	54.6	61.8	67.9	72.0	77.0	78.1	79.3	80.0	—
—	57.7	—	70.6	—	—	75.4	77.3	80.1	—
—	—	—	—	—	42.9	46.9	50.8	—	52.9

Ireland: 1851, 1861, 1871, 1881, 1891, 1901, 1911, 1926;
Italy: 1881, 1901, 1911, 1921, 1931, 1936;
Norway: 1855, 1865, 1875, 1890, 1900, 1910, 1920, 1930;
The Netherlands: 1849, 1859, 1869, 1879, 1889, 1899, 1909, 1920, 1930;
England and Wales: 1851, 1861, 1871, 1891, 1881, 1901, 1911, 1921, 1931;
Scotland: 1861, 1891, 1911, 1921, 1931;
North Ireland: 1901, 1911, 1926, 1937.

TABLE 13 (Continued). — *The evolution of the ratio*

Countries (1)	Definition of urban population *(in italics if that used in the official statistics)*
Sweden	*Division in urban and rural communities according to administrative status*
Switzerland	Popul. of the communities with 2,000 and more inhabitants
U.S.S.R.	*Division in urban and rural communities according to administrative status*
Union of South Africa:	*Division in urban and rural districts according to administrative status.*
a) European popul.	. . . .
b) Non European popul.	. . . .
c) Total popul.	. . . .
Argentina	Popul. of places with more than 1,000 inhab.
Canada	*Popul. of cities, towns and other incorporated places.*
United States of America	*Popul. of cities and other incorporated places with 2,500 and more inhabitants*
Australia	*Popul. of capital cities, of the sourrounding urban municipal areas and of provincial urban districts* Popul. exclusive of full-blood aboriginals
New Zealand:	*Division in urban and rural areas according to administrative status.*
a) Exclusive of Maoris	. . . .
b) Inclusive of Maoris	. . . .
Japan	Popul. of communities with 10,000 inhab. and more

(1) Territory of the countries at the date of the census, unless otherwise noted. Countries arranged by continents and in French alphabetical order.

(2) The figures given are those of the censuses of the following years:
Sweden: 1850, 1860, 1870, 1880, 1890, 1900, 1910, 1920, 1930;
Switzerland: 1850, 1860, 1870, 1880, 1888, 1900, 1910, 1920, 1930;
U. S. S. R.: 1897, 1926, 1939;
Union of South Africa: 1891, 1904, 1911, 1921, 1931, 1936;

of urban to total population.

Urban population in percent of total population according to the census nearest the year (3):									
1850	1860	1870	1880	1890	1900	1910	1920	1930	1935 or later
10.1	11.3	13.0	15.1	18.8	21.5	24.8	29.5	32.5	34.2
32.6	45.8	40.1	44.9	46.7	52.8	59.4	60.8	63.5	—
—	—	—	—	—	14.9	—	—	17.9	32.8
—	—	—	—	35.0	52.9	51.7	55.8	61.3	65.2
—	—	—	—	—	15.0	17.5	16.4	—	22.4
—	—	—	—	—	23.2	24.7	25.1	—	31.4
—	—	33.0	—	—	42.0	58.0	—	(2) 68.0	(2) 74.0
—	—	19.6	25.7	31.8	37.5	45.4	49.5	53.7	—
16.8	20.8	26.2	28.5	35.3	39.9	45.8	51.4	56.2	56.9
—	—	—	—	—	—	—	62.1	63.8	—
—	—	—	39.8	43.1	45.3	50.1	56.0	58.4	59.3
—	—	—	—	—	—	—	—	56.1	56.7
—	—	—	—	16.0	17.7	24.9	32.2	40.8	45.8

Argentina: 1869, 1895, 1914, 1930 (estimated), 1938 (estimated);
Canada: 1871, 1881, 1891, 1901, 1911, 1921, 1931;
United States of America: 1850, 1860, 1870, 1880, 1890, 1900, 1910, 1920, 1930, 1935;
Australia: 1921, 1933;
New Zealand: 1881, 1891, 1901, 1911, 1921, 1926, 1936;
Japan: 1893, 1898, 1908, 1920, 1930, 1935.

Such a development took place in *France*. In 1846 the rural population in that country touched its highest level of approximately 26.8 millions. In the two following decades it remained more or less stationary, but subsequently the downward trend became pronounced. In 1936 the rural population had fallen to 19.9 millions. It is true that urbanization took place more slowly in France than in other countries, but the rural birth-rate did not suffice to fill the gaps caused by migration and by the transfer of rural communities into the urban group.

In *Great Britain* the decline of the rural population began in the sixties of the last century; it continued until the turn of the century, when a slight increase was noted, due however mainly to the generally increased density of the population and to the expansion of towns into the country.

In *Germany* the rural population attained its highest level in the eighteen eighties. Until 1910 it remained practically stationary. A marked decline was first recorded since the 1925 census.

In *Italy* the rural population, with some ups and downs, continued to increase until 1921. In the decade 1921-1931, during which industrialization has made great progress, there has been a decline. In the interval between the censuses of 1931 and 1936 there was a moderate increase of the rural population due to the fact that the economic depression had sensibly reduced migration to the towns and cities, while on the other hand land-reclamation and the general agricultural revival had increased the earning possibilities for the rural population.

In other European countries a decrease of the rural population had been noted in *Switzerland* since the turn of the century, and in *Sweden* and *Hungary* since 1920. Peculiar was the situation in *Ireland*, where the rural population has been declining continually since 1841.

Ireland apart, the decline depended both on migration to the cities and on the transfer of rural communities into the urban group. In countries with a dense population this latter cause was not infrequently more important than the former.

If we consider the other European countries, which we have not yet mentioned, but for which statistical returns are available, we find a sustained increase in rural population in *Denmark, Norway, Belgium, The Netherlands* and, naturally, the agricultural regions of *Eastern* and *South-Eastern Europe*.

In the *Soviet Union* the communities considered as rural in the 1939 census lost, in the period 1926-1939, no less than 18.5 million inhabitants as a result of migration, and the rural population declined in absolute numbers by 6.2 millions.

Census returns for Asiatic countries are available only for *Japan*, where the rural population has declined in absolute numbers since 1930.

In the *United States, Canada, Australia* and *New Zealand* the rural population has increased notwithstanding the rapid urbanization.

In the *Union of South Africa* the rural population of European stock showed a tendency towards diminution since 1931, while the total rural population has continued to increase greatly.

An absolute decrease of the rural population has also taken place in *Argentina*, but this only if 1,000 inhabitants is accepted as the upper limit for a rural place. If, however, the upper limit is placed at 2,000 the rural population has continued to increase.

THE URBANIZATION OF THE NEW COUNTRIES AND EMIGRATION FROM EUROPE.

If in spite of the very rapid urbanization the rural population of the new countries has continued to increase, sometimes very considerably, this is accounted for in the first instance by the fact that it continued to receive immigrants from abroad. On the other hand, the increase in urban population has also been not only the result of internal migrations, but of the direct influx of foreign immigrants as well.

The enormous emigration from Europe which began in the first decades of last century, increasing almost uninterruptedly, until it rose in 1913 to nearly 2 million persons, and in the period 1800 to 1913, brought nearly 50 million Europeans to overseas countries, of whom, in round figures, 32 millions went to the United States, 4 and half millions to Canada, 3.8 millions to Argentina, 3.5 millions to Brazil, 1 and a quarter million to Australia and a few hundred thousands to New Zealand, consisted at the start mainly of rural people, mostly agricultural, who mostly were absorbed into the rural population of the countries of immigration. This was more especially the case with the millions of sons of peasant families who in the second half of last century came from Central, Northern, and North-Western Europe and from Great Britain and Ireland to North America where they built up the rural population. But as early as the last decade of the XIXth century a fundamental change could be noted in this respect. The changed conditions of migration which took place in the countries which until then had been the principal countries of migration and immigration, and the changes in the origin and destination of migration—briefly to allude to the causes—led to a slow, gradual decline in the number of those who at all costs stuck to the traditions of a rural life. The number who on arriving to the new country settled down in the cities along the coast or took the way towards the expanding inland centres and industrial districts grew ever larger. This tendency became yet more pronounced in the following decades and finally came to constitute a characteristic feature of the international migrations of the last two decades.

A few figures will serve to illustrate this most notable development. The 1920 census showed that 13.7 millions of the white population of the United States were foreign born, and of these 10.4 millions or 75 per cent. lived in urban districts. According to the 1930 census 13.4 millions were foreign born and of these 10.7 millions or 80.3 per cent. lived in urban districts, including 38.9 per cent. in cities with over 500,000 inhabitants. In Canada in 1931 the census returned 2.3 millions as foreign born and of these 1.3 millions (56.5 per cent.) were in urban and 1 million in rural districts. A similar distribution of immigrants between town and country is found in Australia, New Zealand, and Argentina. In Argentina, as early as 1914, 68 per cent. of the foreign born population were already in urban districts. Later data for Argentina are not in our possession; but they would

TABLE 14. — *The population of different countries*

Countries	Year of census	Total population in thousands
Great Britain and North Ireland:		
a) England and Wales	1931	39,952
b) Scotland	1931	4,843
c) North Ireland	1937	1,280
Austria	1934	6,760
German Empire (Territory 1st January, 1938)	1933	66,029
The Netherlands	1930	7,936
Denmark	1935	3,551
Belgium	1930	8,092
France	1936	41,907
Latvia (5)	1935	1,951
Italy	1936	42,919
Eire	1936	2,966
Switzerland	1930	4,066
Spain	1930	23,564
Sweden (5)	1935	6,251
Greece	1940	7,201
Hungary	1930	8,688
Estonia (5)	1934	1,126
Portugal	1930	6,826
Poland (5)	1931	31,928

(1) The division is in some countries: under 10,000, 10,000 to 19,999, etc.; in others: up to 10,000, 10,001 to 20,000, etc. — (2) Inclusive of Greater London. — (3) Communities with 100,000 and more inhabitants and

by size of communities about 1935.

Thereof in communicaties with.... inhabitants (1)									
up to 10,000		10,000 to 20,000		20,000 to 50,000		50,000 to 100,000		100,000 and more	
thousands	%	thousands	%	thousands	%	thousands	%	thousands	%
10,245	25.6	3,358	8.4	4,812	12.1	3,480	8.7	(2) 18,057	45.2
1,992	41.4	257	5.3	494	10.2	230	4.8	1,870	38.6
692	54.0	102	8.0	48	3.8	—	—	438	34.2
4,084	60.5	265	3.9	209	3.1	61	0.9	2,136	31.6
33,292	50.5	4,049	6.1	5,240	7.9	3,509	5.3	19,951	30.2
2,891	36.4	1,179	14.9	910	11.5	794	10.0	2,162	27.2
2,171	58.5	298	8.1	173	6.2	138	4.5	771	22.7
4,381	54.1	915	11.3	859	10.6	112	1.4	(3) 1,825	22.6
25,312	60.4	2,697	6.4	2,967	7.1	2,107	5.0	(4) 8,824	21.1
(5) 1,401	71.8	29	1.5	79	4.1	57	2.9	385	19.7
20,541	47.9	6,103	14.2	5,198	12.1	3,118	7.3	7,960	18.5
2,205	74.3	103	3.5	109	3.7	81	2.7	468	15.8
2,829	69.6	225	5.5	185	4.6	194	4.8	633	15.5
13,528	57.4	2,846	12.1	2,513	10.7	1,163	4.9	3,514	14.9
(5) 4,478	71.6	299	4.8	418	6.7	122	2.0	934	14.9
5,063	70.3	385	5.4	517	7.2	180	2.5	1,055	14.6
4,996	57.5	872	10.0	996	11.5	565	6.5	1,259	14.5
(5) 836	74.3	48	4.2	45	4.0	59	5.2	138	12.3
5,453	79.9	350	5.1	196	2.9	—	—	827	12.1
(5) 25,355	79.4	1,101	3.4	1,433	4.5	688	2.2	3,351	10.5

their suburbs. — (4) Inclusive Depart. Seine. — (5) All the rural communities are included into the number of communities with under 10,000 inhabitants.

TABLE 14 (continued.). — *The population of different*

Countries	Year of census	Total population in thousands
Czechoslovakia	1930	14,730
Norway	1930	2,814
Finland	1936	3,807
Turkey	1935	16,201
Rumania (2)	1930	18,025
Bulgaria	1934	6,078
Lithuania (2)	1935	2,349
Yugoslavia	1931	13,934
U. S. S. R.	1939	170,467
Union of South Africa:		
Total population (2)	1936	9,590
European population (2)	1936	2,004
United States	1930	122,775
Canada	1931	10,377
Australia	1933	6,630
New Zealand	1936	1,574
Japan	1935	69,254

(1) The division is in some countries: under 10,000, 10,000 to 19,999, etc.; in others up to 10,000, 10,001 to 20,000, etc. — (2) All the rural communities are included into the number of communities with under 10,000

countries by size of communities about 1935.

Thereof in communities with..... inhabitants (1)									
up to 10,000		10,000 to 20,000		20,000 to 50,000		50,000 to 100,000		100,000 and more	
thousands	%	thousands	%	thousands	%	thousands	%	thousands	%
11,398	77.4	890	6.0	827	5.6	137	0.9	1,478	10.1
2,161	76.8	175	6.2	72	2.6	153	5.4	253	9.0
3,147	82.7	23	0.6	148	3.9	205	5.4	284	7.4
13,474	83.4	577	3.6	821	5.1	251	1.5	1,035	6.4
(2) 14,991	82.7	708	3.9	670	3.7	673	3.8	1,063	5.9
5,071	83.4	272	4.5	278	4.6	170	2.8	287	4.7
(2) 2,176	92.6	22	0.9	46	2.0	—	—	105	4.5
10,826	77.7	1,574	11.3	740	5.3	270	1.9	524	3.8
		(3) 136,442	(3) 80.1			6,711	3.9	27,314	16.0
(2) 7,324	76.4	167	1.7	202	2.1	535	5.6	(4) 1 362	14.2
(2) 1,103	55.0	107	5.3	138	6.9	225	11.3	(4) 431	21.5
64,438	52.5	6,935	5.6	8,585	7.0	6,491	5.3	36,326	29.6
6,505	62.7	485	4.7	588	5.7	471	4.5	2 328	22.4
2,939	44.3	189	2.9	290	4.4	60	0.9	(4) 3,152	47.5
845	53.7	85	5.4	67	4.3	82	5.2	495	31.4
37,502	54.2	6,255	9.0	4,294	6.2	3,685	5.3	17,518	25.3

inhabitants. — (3) Rural population and urban population with less than 50,000 inhabitants. — (4) Communities with 100,000 and more inhabitants and their suburbs.

doubtless show a still more notable increase of the concentration of immigrants in the towns and cities. This tendency is confirmed by the occupational grouping of immigrants. Whereas in 1881-1890 agriculturists still accounted for 55 per cent. of the immigrants to Argentina, the ratio fell to 43 per cent. in 1891-1900, to 32 per cent. in 1901-1910, and to 18 per cent. in 1911-1920.

FROM URBANIZATION TO AGGLOMERATION IN LARGE CITIES.

So far we have spoken of urbanization in general. This term, as defined for statistical purposes, covers however many very different forms of this phenomenon. From the economic and social standpoint it makes indeed a very great difference whether urbanization finds its expression in a great number of flourishing small and medium sized towns which have grown up as an organic development from their background, whose population remains in close touch with that of the surrounding country, and which are crowned, as a result of an equally organic development, by a number of larger cities with their special economic and social functions; or whether it takes the form of the agglomeration of population in the limited areas of enormous cities and industrial districts which are detached from their surroundings and live only by their own rules, and to whom the surrounding country is of importance mainly as affording space for further expansion. This is precisely the picture which looms before our eyes when to-day we speak of urbanization.

Indeed, in many countries urbanization is more and more taking the form of a concentration of population in large cities. In all the countries included in Table 14, which shows the distribution of the population between 5 size groups of communities, it is—with the exception of the agricultural countries of South-Eastern Europe—the communities with less than 10,000 and those with 100,000 and more inhabitants which, in the aggregate, account for the largest percentage of the total population.

The census returns for 1935 or thereabouts, show the following ratios of the population of the cities with 100,000 and more to the total population:

Australia	47.5 per cent.	Denmark	22.7 per cent.
England und Wales	45.2 »	Belgium	22.6 »
Scotland	38.6 »	Canada	22.4 »
North Ireland	34.2 »	South Africa:	
New Zealand	31.4 »	European popul.	21.5 »
Germany	30.2 »	total popul.	14.2 »
Austria	31.6 »	France	21.1 »
United States	29.6 »	Latvia	19.7 »
The Netherlands	27.2 »	Italy	18.5 »
Japan.	25.3 »	U.S.S.R.	16.0 »

According to the figures published in the German statistical review *Wirtschaft und Statistik* (1), there were in the world in 1939 700 cities with 100,000 inhabitants and more. Together they accounted for over 250 million persons or 11.7 per cent. of the total world population. Particularly advanced is the agglomeration of the population in large cities among the white race, as is shown by the figures of the population of large cities in the different continents. In Australia the ratio of large city to total population stands at 36.3 per cent., in America at 21.7 per cent., and in Europe at 21.1 per cent., as against 6 per cent. for Asia and 3.6 per cent. for Africa.

III. — For and against urbanization.

Urbanization as a necessary consequence of the growth of population and of industrial development.

Migration from the country to the town is as old as the towns themselves. History teaches—and statistical enquiries corroborate it over and over again—that left to themselves towns in the long run are unable to replace their population, still less to increase it to any significant extent. The influx of new blood from the country is for the towns a question of life or death. On the other hand, the country is dependent on the urban and industrial districts for absorbing its surplus population. It is there that the surplus rural population is collected and made available for further progress. If the capacity of the towns for absorbing the rural surplus population fails, the only alternative is that of temporary or permanent emigration. Should this outlet be closed, or should it afford only limited opportunities, then the maintenance of a high rural birth-rate can only lead to congestion and impoverishment. The validity of these general statements can easily be proved by examples taken from life.

To condemn urbanization outright, as is so frequently done, is therefore unjustified. As long as urbanization proceeds quietly and in an orderly manner as one of the many phases of economic and social development, and as long as the balance between town and country is not upset, urbanization, in spite of its ever present drawbacks, does not present a serious problem either for the town or for the country. But it is otherwise if urbanization and along with it, migration from country to town, assumes the proportions it did in the last hundred years in many countries, leading to the concentration of an ever increasing percentage of the population first in towns, and then in large cities, while the rural population increases but little, stagnates, or finally loses to the cities more than its natural rate of increase, thus endangering its own vitality. Not infrequently a situation arises in which migration to the cities continues even during periods when there is not

(1) *Wirtschaft und Statistik*, 20. Jahrgang, No. 21, 1940, I. Novemberheft.

enough work for the city population itself and the number of unemployed increases, while the countryside goes short of the labour it needs for the work to be done and for bringing its economic activity on a level at which it should stand in the general interest. Then, as has often been the case in past epochs, urbanization, with its many economic, political, moral and above all demographic consequences, becomes one of the most serious problems.

The causes of the world wide urbanization of the present day are many and various. It would be superfluous to enumerate them one by one; they are dealt with in an extensive literature which discusses them in detail and from several points of view. They all arise from the general economic, social, and political evolution of our times and from the rapid growth of population. The present urbanization would not have been possible without the increase of population which took place in the last hundred years, and that increase, on the other hand, cannot be separated from the great economic and social progress which offered possibilities of work and life for ever increasing masses of men. In its turn, the continuous rapid increase of population stimulated further progress and encouraged yet further industrial, commercial and transport expansion. In view of the close connection between general economic expansion and the growth of population it would be idle to enquire which of them was the primary cause.

We give some figures to illustrate the proportions taken by the growth of population in the XIXth century, as this, only too frequently, has not been taken into due consideration in discussing the problem of urbanization. It is estimated [1] that the population of the world rose from 906 millions in 1800 to 1,171 millions in 1850, 1,608 millions in 1900 and 2,057 millions in 1933. This extremely rapid increase started in Europe where the population rose from 187 millons in 1800 to 401 millions in 1900 and 519 millions in 1933. Still more striking is the increase when considered for particular countries or for large territorial areas. Pressing needs drove the population to crowd into industrial districts and towns, so that, one after another, the large cities came into being.

An essential preliminary condition of the agglomeration of great masses in a restricted area has always been the possibility of supplying them with all requisite consumption goods, and more especially with foodstuffs. In this respect the evolution of the last hundred years has been unprecedented. Thanks to the great progress made in technical knowledge, agricultural production increased continuously. Modern means of transport made it easy to bring at a low cost the products from far away to the localities where they were needed. The expanding areas brought under cultivation in the new countries and the development of large colonial territories enabled urbanization in the old countries of Europe to proceed far beyond the limits which their own agricultural resources would have allowed. The growth of agricultural production and urbanization are therefore two aspects of the same development, however widely they may differ from some points of view.

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(1) CARR-SAUNDERS, A. M.: World Population. Past Growth and Present Trends. Oxford, 1936.

Technical progress set free an ever increasing number of workers in rural districts; the number of those who can find work only in the towns grew steadily. In spite of territorial expansion and higher yields, the capacity of agriculture to absorb new labour increased but slowly. At the same time the opportunities for employment open to the non-agricultural rural population have been steadily decreasing. A great number of handicrafts and small rural industries were ruined by the concentration of industrial activities in large factories situated in urban districts. The industries processing farm products were no exception to this rule. One after another many small mills, breweries, spinning and weaving shops disappeared. Commerce also followed the tendency towards concentration. The big merchant displaced the small trader, the city store the rural shop. The town is the centre of progress, trade, industry and administration, and the scientific and artistic institutions also have their seats there. The occupational opportunities offered by the city grow uninterruptedly, and as the cities also offer better earning and more agreable living conditions than the country, they possess a great power of attraction for the rural population.

The problem of urbanization in the decades prior to the World War.

The judgement passed on urbanization some decades ago necessarily differed from that of to-day. Urbanization was then considered in the first place as a sign of progress. People only saw, or only wished to see, the splendour and power of this development, and many and increasingly large cities were considered the surest evidence of the progress of industry and civilization, of power and greatness. All that the aspiring spirit of man had created came from the cities. On the other hand, in many European countries, for instance, the expansion of trade and industry leading to that of the towns, alone made it possible to employ all or at least most of the increased population in the service of its own nation. Many of the now flourishing European industrial countries were then in a position similar to that now occupied by the industrially poor Balkan countries with their overpopulated rural districts, and the only choice open to them was urbanization or emigration. The warnings given by attentive observers, who pointed to dangers looming ahead, failed to secure attention. The stream of expansion flowed cityward and it was vain to point to the dangers when the advantages were so apparent. The development could take no other direction, and we should not judge the phenomenon fairly were we to do so only in the light of our present experience and observation.

As we have shown above, the unprecedentedly rapid growth of the population left no alternative to urbanization. If this development was in some respects unhealthy, the reasons for this lay not so much in urbanization itself as in its being unplanned, and in the excessive rate at which it often took place, thus greatly accentuating the drawbacks and harmful economic, social, sanitary and political aspects of the phenomenon. This, however, was the price paid for progress.

Yet the rural districts have also gained by this development. Agriculture made unprecedented progress. Huge as was the migration from the country to the town, it had no alarming results with the exception of a few small areas and a few countries in which migration was mostly due to quite special causes not directly connected with urbanization. Above all, there was no falling-off in the natural increase of the rural population. Agriculture saw in the rural exodus mainly a labour question. Labour-saving technical progress often failed to keep pace with the situation. In the old peasant countries of Europe the adoption of labour-saving devices was greatly hindered by the existing organization of production and the increasing competition of the agricultural production of the new countries. The fact that the first to leave the countryside were the most active and industrious, and therefore the most productive of the rural population, might be a matter of concern to persons interested in population problems, but agriculture still failed to realize the importance of the matter and did not demand much in this respect from the great mass of its workers. Much deeper resented by the rural population were the consequences of the fact that, with the expansion of industry and trade their political influence decreased continually. Political activity and power had now their seat in the towns. The country felt itself neglected and forgotten and this opened a breach between town and country which, in many countries, has grown ever wider down to our own day.

The above sums up the essential points of the problem of urbanization as it mostly presented itself before the outbreak of the first World War and as it was discussed in an extensive literature.

Urbanization to-day a vital problem for many countries.

It was only in the course of the last two decades that the manyfold aspects of the problem of urbanization have come to the fore. The war encouraged technical progress and created many opportunities for further industrial developments. Thus, few years later a new wave of industrialization was set going which affected all the more advanced countries and in many of them started an exodus from the rural districts to the towns on a larger scale than ever before. Yet, the demographic conditions underlying this exodus were undergoing a fundamental change. The number of countries in which the towns could no longer draw on the overflowing population of the rural districts increased. This was a fact which could not be thoughtlessly passed over by even the most confirmed optimist, and which inevitably called for a thorough reconsideration of the whole complex question. New and often elaborately prepared enquiries were undertaken to throw light on the matter. This was in part due to the fact that population problems in their many aspects were given much more consideration than formerly. The study of the question was further promoted by the fact that the ups and downs of the movement were in more than one respect extremely instructive in forming a judgement of the problems of migration between town and country.

In many countries during the years 1925-1929 rural exodus developed to an extent never before recorded. Then the economic depression set in and checked the rush to the cities. In many cases the number of those who turned their backs on the town exceeded the number of new arrivals. The years came when there was much talk about the "flight from the towns", with as much haste and often with as much inaccuracy as previously the "flight from the land" was spoken about. Here and there it came to the intervention of governments with a view to regulate and to control the backward movement. It was the time of small suburban settlements, of unemployed colonies, of re-education, etc.

But the acute stage of these problems lasted only for a short time. As soon as economic recovery set in and the millions of unemployed were reabsorbed in production, the migration to the towns recommenced and, in some cases, became even larger than ever before.

Once more one breathed more freely, relieved from a great cause of anxiety. What would have become of the urban population which the depression had rendered superfluous? All too soon it had become apparent that a return to the land was only possible on a small scale, and that innumerable difficulties stood in the way of its practical application. The number of population which the rural districts can support is, indeed, limited, unless it is ready to renounce participation in the general progress. The depression clearly showed the old but often forgotten fact that the possibilities of work and gain essential for the support of the increase in population must be found in urban occupations.

The progressive revival of urbanization which started as soon as the recovery from the depression set in, is therefore from some points of view a very desirable event. If it gives rise to such apprehensions this is due to general considerations of a political and demographic nature.

In many countries urbanization developed to an ever growing extent into a migration towards the large cities, and its undesirable features thus become more obvious than formerly. It cannot be denied that the ever growing large cities are centres of great efficiency in science, economics, technology, public health, etc., but these great achievements are paid for by an excessive drain on the nations vitality, by the complete uprooting of many millions of men, by the loosening of moral ties and customs, by an alarming fall in the birth-rate, and by the misery and unrest of the masses in times of economic depression.

In a growing number of countries one is anxiously asking the question how much longer the country population, whose birth-rate is also falling in a marked degree, will be able without undesirable consequences to fill the gaps made by death in the urban population and also to supply new labour forces. Will the decline in the rural birth-rate lead at last to the results which can already be observed in some countries, where the now thin stream of migrants from the country flows almost exclusively to the few most highly developed cities? In view of the threatening danger, should the endeavour be to reserve for the country the natural increase of the rural population and to encourage rural rather than urban economy? What limits are set to such a policy? Or are the possibilities of avoiding the danger but limited and is the further growth of urbanization inevitable? If this is so, can its harmful results be at least reduced compared with

what they have been in the past ? These are very serious questions which recent developments raise and which demand a solution. That the development can no longer be merely allowed to proceed further is now obvious to all.

The way out.

A glance at the measures taken in the several countries shows that extreme solutions are not possible and that success can be secured only by a long-sighted and well considered policy wich endeavours, on the one hand, to reduce the evils and dangers of urbanization, and, on the other, to assure the stability of a healthy rural population living under economically sound conditions, and to strengthen it numerically so far as possible, even at the cost of considerable sacrifices to the community.

One aspect of this programme concerns the towns. If a large part of the population must unavoidably dwell in the cities, ways and means must be found to reduce the detrimental effects of city life on the people. It cannot be denied that housing improvements and better sanitary conditions have secured notable results in many countries. Many towns are deservedly proud of their exemplary institutions for promoting public health and social welfare. Indeed, it is a fact that to-day the opinion formerly held that the rural population enjoys better health than that of the towns is often no longer tenable. The rural mode of life and work makes undoubtedly fewer claims on nerve-strength, and an outdoor life promotes health, but on the other hand in many countries the hygienic and sanitary conditions in rural districts are more than primitive and the housing conditions are often deplorable. On the other hand, one must certainly not overlook the fact that the still relatively high birth-rate, the low death-rate, and the good health of the city population are largely due to the influx of young and healthy elements from the countryside. If this influx were to cease, the effects of city work and life on the health of the population would probably soon make themselves more felt.

Everything must therefore be done, when the situation gives rise to justified anxiety, to reduce the deficit of the biological balance of the city population. In this connection, great importance should be attached to the efforts made in all countries where urbanization has reached an advanced stage to decongest the great cities and to transfer new industries into rural districts, now that technical progress has made this possible on a much larger scale than formerly. In this way the industrialization of whole regions could in future be checked. This policy should be accompanied by a suitable housing programme and it is surprising to see how many errors are still being committed in this domain.

The second part of the measures envisaged by the programme concerns the country. The central question here is always that of finding a means for reducing the social and economic slide from the country to the town. The limitation of the right of free choice of domicile, introduced in some countries recently with a view to keeping people away from the cities, can only be thought of as a provisional expedient. Were such measures enforced for long they would

only widen the gap between town and country. The only permanent remedy for the evil is to be found in measures which will re-establish a proper social and economic balance between town and country.

Much has doubtless been done in the course of last twenty years or so for improving the economic situation of the rural districts, and especially for improving the conditions of its chief economic activity, agriculture. There is no need to go here into details. Suffice it to say that recent legislation often consists of a miscellany of uncoordinated measures, whereas, if the end in view is to be secured, a fundamental change of outlook is required. Only by adopting a bold programme which does not fear to put accepted opinions to the test, and only by the initial outlay of considerable sums of public money, will it be possible to enable the country districts to participate to a larger extent than heretofore in the blessings of progress, and to create a new village life which will close the gap between town and country.

But even the most courageous measures will be unable to prevent a further decline of the rural population in some districts. However great may be the importance attached to preventing a decline in the number of the rural population that is not the only point at issue. Of like importance, especially, from the standpoint of urbanization, is the question of quality, and there may be many cases in which the conditions of country life can only be permanently improved by settling part of the rural population elsewhere and by the transformation of the whole structure of rural economy.

* * *

Our treatment of the subject has been of too general a character to allow of a careful weighing of the arguments for and against urbanization; it only outlines some observations. In doing this, we had in view in the first instance, certain conditions which have arisen in many advanced countries where urbanization has become a problem of national concern and is more and more recognized as such; this is the case, for instance, in Europe, in Great Britain, Germany, and France; in America, in the United States and Canada, but it is also so in Argentina, Australia and New Zealand. Alongside of these countries are others, as, for instance, Italy, where urbanization is making itself felt, but where as a symptom of industrialization it is desired for considerations of demographic nature, though in other forms than those heretofore taken, emphasis being placed on decentralization, so as to avoid as far as possible the drawbacks noted elsewhere.

Apart from these two groups of countries, there are a large number of others — for instance those of Eastern and South-Eastern Europe — in which the rural population problem is of a quite different character, their trouble being that of rural congestion. In this case, only one really national solution of the problem is possible, i. e. the intensification and rationalization of their agriculture and the development of industry and trade. The former would in any case only be possible on a large scale if at the same time earning possibilities were provided for the people who would thus have to abandon agriculture.

In the above study, in spite of its unequal constitution the rural population has been dealt with as a unit, and so many questions which, from an agricultural standpoint are of more importance now than ever, could not be discussed. First among these is the question of the evolution of the agricultural population, the most important part of the rural population, namely the very marked relative, and in many countries even absolute, decline in numbers noted in the last decades. If the problem of urbanization is to be grasped in its full proportions, this evolution must be known. In one of the next numbers of this Bulletin we will, therefore, bring together, as we have here done for urbanization, the available statistical data on the development of the agricultural population. It will then be also possible to get closer insight into the causes and the consequences of rural exodus.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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AGRICULTURAL ECONOMICS AND SOCIOLOGY

THE OVERINDEBTEDNESS OF FARMS AND THE MEANS FOR ITS PREVENTION AND CONTROL

by Dr. G. Costanzo

Summary: I. General situation. – II. Nature and chief forms of overindebtedness. – III. The credit policy of the banks. – IV. The intervention of the public authorities. – V. Conclusions.

I. — General situation.

In a study published in 1937 we noted the growth of agricultural indebtedness after the war (¹), its consequences, and its increase as a result of the world economic depression. We then stressed the extremely complex nature of this phenomenon whose causes are many, ancient and recent, general and peculiar to particular countries, normal and abnormal.

Leaving aside the abnormal causes of indebtedness, more or less connected with war-time conditions, we now wish to draw attention to the importance of certain facts which have recently led to a growing demand for credit.

One of these facts is the movement for transforming a large mass of agricultural labourers into smallholders, a transformation which has been brought about either through a spontaneous and steady evolution, as in the countries of Western Europe, or by a sudden change partaking of the nature of a social revolution, as was the case in some countries of Central and Eastern Europe at the time of the agrarian reforms (²). Both these forms of creating small landowners have given rise to considerable investments of capital supplied in part by the banks, capital required sometimes for the purchase of the land, sometimes to cover the cost of developing and equipping the new holdings.

Now if in both these cases the payment of the price of the land was an expense which could be borne as it was connected with plans of land settlement or with systems for the formation of small holdings controlled by the Government authorities, a very different situation arose when land was purchased on the open market often affected by speculation, which took advantage of the fierce competition between the several parties all desirous of acquiring holdings. This

(¹) « Agricultural Indebtedness » in the January, February, March and April 1937 issues of the *Monthly Bulletin of Agricultural Economics and Sociology*. International Institute of Agriculture. Rome.

(²) To give an idea of the importance of this movement we need only note that in the period 1929-1938 an area of 25,205,859 hectares was expropriated for the purposes of the agrarian reform.

produces a rise in the price of land, often to unreasonable levels, more especially in periods of inflation which, by causing rapid increases in the monetary value of real estate, provoque a rush for agricultural investments. A large demand for credit used in speculative land purchases then arises, thus increasing for many years the burden of debt. The advisability of eliminating the drawbacks of such a situation has induced some governments to adopt measures for controlling the real estate market (1).

Another fundamentally important cause of indebtedness is that inherent in modern methods of farming. These require a broad and general process of specialization and industrialization of agriculture, entailing an ever larger application of chemistry, engineering and electricity on the farm, and the scientific organization and equipment of the farms. In general, the modernization of the methods of cultivating, working, processing and marketing requires the use of large amounts of capital which, owing to the largeness of the investments and the slowness with which they are reproduced, cannot be supplied by the savings which the farmer himself can make but must draw upon the savings of the community entrusted to the banks and transformed into capital.

The same remarks apply to another group of investments which have also increased considerably in the last few years, we refer to permanent land improvements and more especially to the improvements in rural buildings. These investments have grown to a remarkable extent, sometimes out of proportion to the importance of the farms, thus giving rise to excessive indebtedness.

Farm indebtedness became particularly heavy owing to the agricultural depression which in several countries clearly showed the critical financial situation of many holdings. It will be remembered that during the inflation period which gave the farmers, whose produce commanded high prices, the illusion of prosperity, large credits were granted to producers. The large profits then secured made the very onerous conditions on which these credits were granted seem tolerable. The facility with which they were granted and accepted and the use to which they were put by the borrowers were such that the loans were not always advantageous and profitable. New lands were bought, new buildings were erected and existing ones were enlarged, plants of different kinds, mostly very expensive, were installed. But this situation, which is characteristic of war-time economy, could not long outlast the war itself. After the 1920-21 deflation the prices of agricultural products fell rapidly, while many of the principal items of cost of production were not deflated. This was true more especially of fiscal and social costs, wages, interest on debts, etc. Agriculture therefore had to endeavour to adjust costs to price levels. The index-numbers of prices of agricultural products and of the principal means of production showed a wide disparity. During the period from 1924 to 1929 the agricultural situation had improved almost everywhere; and yet, even at the prices ruling during that

(1) See our article on « The Agricultural Land Market and its Control ». *Monthly Bulletin of Agricultural Economics and Sociology*, No. 5, May 1941.

period, the price-costs ratios in agriculture were unfavourable to the farmers. In Switzerland in 1928 the index number of prices (1914 = 100) stood at 151, that of the costs of production at 172; in Holland in June 1929 the index numbers (1910-11 to 1913-14 = 100) stood at 129 for farm products, 204 for wages, and 163 for all costs; in Sweden in 1927-28 the index numbers (1909-13 = 100) stood at 143 for farm products, 196 for wages, and 152 for the goods purchased by farmers. Thus even before the beginning of the agricultural depression, the maladjustments in agriculture were alarming. The falling prices which started in 1930 became extremely rapid, while a reduction of costs was exceedingly difficult to achieve. In 1930-31 the International Institute of Agriculture, while studying the price relations for some important agricultural staples in certain countries on the basis of calculations based on farm accountancy data, observed that in many cases prices were below production costs. It is readily understood that, under such conditions, with prices which, for instance in 1931, had fallen 50 per cent., even very moderate charges could represent an excessive burden.

Moreover, it is evident that the cost of mortgage credit under loans arranged during the inflation period, and therefore based on artificially swollen land-values and on abnormal rates of interest, weighed heavily on the farmer. Such loans were no longer in keeping with the conditions. Thus frequently the gross profits of the farm were below the interest charges for the debt, so that their payment became impossible and in the countries most severely affected by the depression the banks had to take steps to avoid wholesale failures. Thus, for instance, in the United States not only the service of the debts but even the taxes were not met, with the result that the number of distraints on farms and of foreclosed mortgages increased greatly. Distraint for taxes or debts, which fell in 1929 to the lowest figure recorded for many years, more than doubled in 1932. The total number of farms distrained on in that country rose from 19.5 per thousand in 1929 to 20.8 in 1930, 26.1 in 1931, and 41.7 in 1932.

The mortgage indebtedness of agriculture, was extremely grave in Central and Eastern Europe; but in this respect conditions as a whole were far from satisfactory. Unfortunately statistics for agricultural indebtedness are either altogether lacking—as is generally the case—or else they are incomplete or defective. In some countries, however, special enquiries into agricultural indebtedness have been made which enable us to give a few particulars.

In *Germany* agricultural indebtedness rose from 10,300 million RM. in 1926-27 (1) to 13,200 millions in 1929-30, to 13,900 in 1931-32 and 1932-33, after which it fell to 13,400 millions in 1935-36, and to 12,500 millions in 1939-40. The interest charges rose from 820 million RM. in 1927-28 to 980 millions in 1929-30 and to 1,010 millions in 1931-32, after which they fell to 850 millions in 1932-33, to 650 millions in 1935-36, and to 555 millions in 1939-40. The number of foreclosures rose from 2,123 in the business year 1927-28 (37,066 hectares) to 6,452 in 1931-32 (176,005 hectares).

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(1) DIE KREDITLAGE DER DEUTSCHEN LANDWIRTSCHAFT IM WIRTSCHAFTSJAHR 1939-40. Deutsche Rentenbank-Kreditanstalt. Berlin, 1941.

In *Hungary* a special enquiry made by the Central Bureau of Statistics in the crisis years 1929 to 1934 shows that debts increased from 114 to 162 pengoes per cadastral yoch [1]; at the end of 1932 the total agricultural debt amounted to 2.2 thousand million pengoes; 49 per cent of the landowners and 36 per cent. of the land were encumbered; the limit of forty times the net land-register revenue, a ratio above which the estate is no longer considered as profitable, was exceeded in the case of 22 per cent. of the debtors (14 per cent. of the area) on farms of a size not exceeding 5 cadastral yochs, and by 19 per cent. of the debtors (19 per cent. of the area) on farms covering an area of not less than 5 and not exceeding 100 cadastral yochs.

The Swiss Peasants' Secretariat [2] estimates that the farm mortgage debt in *Swirtzerland* rose from 3,324 million francs in 1911 to 4,189 millions in 1931.

The total liability, including chirographic and current debts, rose in the same period from 3,779 to 4,788 million francs, showing an average annual increase of 50 million francs. In 1931 agricultural liabilities amounted to 42 per cent. of agricultural assets. Mortgage indebtedness, which accounted for the main portion of the debt, rose from 2,111 francs per hectare in 1906-13 to 2,589 francs in 1914-19, to 3,108 in 1923-27, to 3,616 in 1931, and to 3,771 in 1932. In the opinion of the Secretariat a farm is generally considered as heavily encumbered when its indebtedness exceeds 5,000 francs per hectare; and it was estimated that on the average for the whole country about 25 per cent. of all farms, or roughly about 50,000 in all, belonged to that class. Further enquiries showed that in 1934 the liabilities of Swiss agriculture amounted to more than 55 per cent. of its assets.

In *Sweden* an enquiry into agricultural indebtedness made by the Central Bureau of Statistics in 1933 shows that the indebtedness of 15.7 per cent. of the farmers amounted to 50-75 per cent. of their assets. The Statistical Yearbook of Sweden shows that the total agricultural mortgage debt rose from 2,287,330,008 crowns (47.6 per cent. of the taxable value) at the end of 1913 to 4,850,288,521 (47.4 per cent. of the taxable value) in 1928, and to 5,000,935,000 (49 per cent. of the taxable value) in 1933.

In *Denmark* the total mortgage debt encumbering agricultural real estate was estimated in 1933 at 3,750 million crowns, as against 5,400 million crowns representing the aggregate value of the farms.

In *Finland* the total agricultural debt was estimated in 1929 at 5,920 million Finnish marks; of which 1,135 millions, i. e. 20 per cent., were accounted for by long-term loans. The precarious situation of farm property during the depression is shown by the number of foreclosures which rose from 1,623 in 1931 to 2,526 in 1932, 3,296 in 1933 and 2,651 in 1934.

An official enquiry placed the agricultural debt in *Rumania* at 52,348 million lei in 1932, of which 14,971 millions were accounted for by the debts of 16,839 landowners, owning more than 10 hectares each, or a total area of 887,573 hectares; the average debt per hectare thus stood at 16,867 lei. The indebted-

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(1) 1 cadastral yoch = 0.5754622 ha. = 5754.622 sq. m.

(2) LE SURENDETTEMENT ET LE DÉSENDETTEMENT DANS L'AGRICULTURE SUISSE. Rapport du Secrétariat des Paysans Suisses. Printemps 1934. Brougg, 1934.

ness of 2,474,789 farmers owing less than 10 hectares each, stood at 37,376.8 million lei on a total area of 9,692,000 hectares, the indebtedness per hectare thus being 6,561 lei.

In *Bulgaria* the agricultural indebtedness at the end of 1935 amounted to 11,828 million levas for a total of 860,000 farms; the average debt per farm thus stood at 13,753 levas, and as the average size of a farm is 4 hectares, the cost of the debt per hectare of arable land averaged 3,996 levas.

An enquiry made in 1934 showed that farm indebtedness in *Greece* then amounted to 9,992,070,807 drachmas; deducting the amount due to the Agricultural Bank for credits on current accounts, which are generally settled after the harvest and then reopened, the remaining 7,907,925,678 drachmas were chargeable to 650,000 farmers out of a total of 953,000 (68 per cent.). If this liability is considered in relation to the total gross farm income, which at that date was estimated at 15,000 million drachmas, we find that the liability amounted to 50 per cent. of the income.

In the *United States*, farm mortgage indebtedness was estimated in 1932 at some 8,500 million dollars and the total agricultural debt at 12,000 millions [1].

The reports of the Farm Credit Administration on the special financial measures taken by it to meet the credit crisis caused by the world economic depression show that many applicants for relief were indebted beyond the maximum legal limit.

The serious financial situation of agriculture is confirmed by the farm accountancy data collected by the International Institute of Agriculture which show that during the most critical years of the economic depression, covering the period from 1927-28 to 1931-32, the following conditions prevailed in the countries concerned:

(1) The social revenue expressed as a percentage of farm expenses showed since 1927-28 a downward tendency which became accentuated in the years 1930-32;

(2) The fiscal charges per hectare stood at practically the same figure during the whole five-year period;

(3) Net returns, i.e. the returns on the capital invested in the farms, declined in 1930-31 and in 1931-32 in all the countries concerned, in some cases being negative;

(4) The remuneration of family labour also declined both as a result of the reduction of daily wages and owing to the diminution in the labour employed on the farms;

(5) In those cases in which the service of the debts encumbering the farm is mentioned, the return on farm capital is also frequently negative; this not only means that the capital investment yields no return, but also that the remuneration of family labour is also reduced and has both to forego profits and to bear the losses incurred;

(6) Interest charges on debts remained practically unchanged during the whole of the five-years period, which shows that the farms were unable to acquit themelves of their debts.

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(1) YEARBOOK OF AGRICULTURE, 1935. United States Department of Agriculture. Washington, 1935.

The consequences of this state of affairs were felt by the whole community. Governments could not disregard the problem of agricultural indebtedness, and a great effort was made to set it in order [1]. According to the nature of the measures taken for this purpose the countries can roughly be divided into the following three groups:

The first group is that of the Governments which took radical steps for releasing farmers from the burden of indebtedness. The second is that of the Governments which, while engaging in direct action in the matter of agricultural debts, have limited their measures to helping the debtors without seriously interfering with the interests of the creditors. The third is that of the Governments which have tried to help debtors indirectly, by a general policy for strengthening and protecting agriculture economically, without infringing the principle of the respect of contractual obligations.

The first type of policy and legislation has been followed in some parts of Central and Eastern Europe; it is characterized by the compulsory conversion of farm debts or by the legal reduction of interest rates, and in some cases of the capital amounts due.

The second type of policy and legislation which in some countries has been combined with the first type, finds its concrete expression in measures for the repayment of loans by instalments, for the suspension of mortgage foreclosures and distraints for debt, for securing by special methods of procedure direct agreements between debtors and creditors, the fixing of minimum prices for properties distrained on, etc.

The third type of policy and legislation is that generally adopted in those countries in which the economic organization is based on spontaneous action. The Governments endeavour to avoid as far as possible all official action for the compulsory modification of private law, contractual relations arising from the financing of farms, the aim being to relieve agriculture from the burden of excessive indebtedness by action taken to assist and improve agricultural economy.

A fundamental study of the matter shows, however, that most of the measures taken to reduce the burden of debt have only been paliatives dealing with effects rather than causes, and have only endangered the future working of credit. Creditors have reacted energetically against legal coercion which altered substantially the relations between debtor and creditor and gave rise to great uncertainty in the matter of agricultural credit. The methods adopted for assisting agriculture have been severely criticized by the lenders, more especially by the banks. The effects to which these methods gave rise were harmful to credit in general, and more especially to the debtors whose real condition was not improved, as at the end of the delay granted them for the repayment of the debt, the creditors recovered their rights and could claim the capital amount, and as the debtors were not, as a rule, able to pay it, their situation again became so critical that they were liable to eviction from their farms. Such cases were not rare. As to the banks,

[1] For particulars on this matter see our study on indebtedness above mentioned.

the fact that some of their losses were covered was not always sufficient to induce them to convert the loans, as by such action they would have immobilized large sums for a certain time. This was indeed the problem which the conversion of agricultural loans raised for the banks. On the other hand, the partial remission of debts was not in the best interest of the farmers themselves, as it destroyed even the limited credit that they previously enjoyed.

In some cases the shock given to the machinery of credit reacted upon national finance as the measures taken for disencumbering agriculture often involved the Governments into large scale financial operations. We need only mention in this connection the measures taken for disencumbering the Eastern provinces of Germany (*Osthilfe*) under the law of 31st March 1931 which allocated 561.7 million RM. for disencumbering 41,435 estates (1). Again, in the United States the Federal Land Banks and the Land Bank Commissioner in the period 1st May 1933-31st December 1934, made 575,840 loans for 1,494,454,231 dollars (2) with a view to adjusting the farm mortgage debt to existing conditions.

The unsatisfactory results of the various measures tried, and the fear that similar credit situations as those above referred to, which have done so much harm to agriculture, might again arise, have led to the consideration of the advisability of taking measures to prevent the recurrence of over-indebtedness.

II. — Nature and chief forms of overindebtedness.

The concept of overindebtedness is necessarily relative. Given the special conditions of a farm and the personal status of the farmer, indebtedness may, in specific cases, be either normal or excessive. Thus again, a farm which may be normally indebted under the agricultural conditions prevailing in one country, may be overindebted under those prevailing in another. The different cost, price, and income movements in the several countries and the difference in the standards of living are such that a farm may in one case be normally and in another excessively indebted. It is difficult to set up a standard by which to judge when normal indebtedness gives place to overindebtedness. The limits between the two conditions can only be indicated empirically. In some countries estates are considered excessively encumbered when the indebtedness exceeds a certain percentage of the assets per hectare; in others a fixed percentage of the price per hectare is laid down or else a percentage of the yield or of the taxable value or of the appraisement value or market value of the land.

As the problem at issue is eminently a practical one, it is not easy to theorize on it; it would however seem advisable to note some of the distinctions drawn by the more recent writers on the subject (3).

(1) ENTSCHULDUNG DER OSTDEUTSCHEN LANDWIRTSCHAFT, bearbeitet von LEO DRESCHER. Bank für Deutsche Industrie-Obligationen. Berlin, 1938.

(2) R. R. STAUBER, Agricultural Economist, and M. M. REGAN, Associate Agricultural Economist: The farm real estate situation, 1934-35. Circular No. 382, December 1935. U. S. Dept. of Agriculture, Bureau of Agricultural Economics. Washington, D. C.

(3) See among others W. BÄGGLI, agr. eng.: Die Überschuldung der Landwirtschaft. Möglichkeiten zur künftigen Verhinderung. Bern, 1936.

A first fundamental distinction which is usually drawn is that between objective and subjective indebtedness. If considered exclusively from the standpoint of farm economy, indebtedness exists when the service of a loan invested in the undertaking does not exceed the net income which can be secured under the mode of farming practised in the country, with the labour there available, and at a certain rate of prices and costs. The estate is considered to be overindebted from the standpoint of farm economy, i.e. from an objective standpoint, when to meet debts or current or matured repayment quotas, the farmer has to sell at a loss his working equipment and means of production (implements, machinery, livestock, etc.), thus endangering the future working of the farm.

Overindebtedness arises from the variable reciprocal action of a whole series of factors, such as the relation between the amount of borrowed capital and interest and amortization costs, on the one hand, and the yields, the prices of the products, the cost of labour, the purchase prices of the means of production, and the standard of living of the farmer, on the other. Obviously, the behaviour and the intensity of the several factors may render overindebtedness more or less heavy, or even liquidate it. Moreover, the action of any one of the said factors may cumulate with the effect produced by the alteration of another factor, or may offset it. This occurs for instance when high natural yields coincide with low prices for products, moderate rates of interest, and large debts.

There are also other causes the intensity of which may give rise to overindebtedness, causes directly connected with the personal situation of the farmer, the amount of his capital, the standard of living of his family, its composition and the age of its members. In such cases we speak of subjective indebtedness.

Of course subjective causes enter also into the formation of objective overindebtedness. A typical example is afforded by the influence which the personal ability of the farmer may have on the volume of yields and on costs.

Moreover, the effects of objective overindebtedness may be attenuated or intensified by subjective overindebtedness; hence the practical importance of the distinction thus drawn.

In the peasant family type of economy which is prevalent in many countries the management of the family and of the farm forms an indivisible whole. Consequently good receipts obtained from the farm may be absorbed by heavy family liabilities or the losses on the farm may be offset by the lowering of the standard of living of the family. A farm objectively overindebted, which is worked exclusively by members of the family, may be able to hold its own if they live on a modest scale and accordingly have a smaller cash expenditure then would be required for hired labour. On the other hand, if a farmer whose farm is only moderately encumbered has heavy family expenses, he may find himself in difficulties, although the farm itself is not overindebted.

Absolute overindebtedness is often incurred in the act of the purchase of the holding. This generally occurs in those cases in which the purchaser does not realize the relation existing between farm income and costs, and therefore pays more for the farm than it is worth, without disposing of sufficient means of his own to make the purchase.

The extent of the overindebtedness of the estate as such depends on the excessive purchase price of the land, and of farm buildings, and on the proportion of the purchase price covered by the purchaser's own means. The smaller these are, the heavier will be the indebtedness incurred.

Now, as it takes a long time to recover the capital invested in agriculture and as, therefore, even under favourable conditions, loans can only be extinguished by small instalments, long-term indebtedness, owing to the impossibility of foreseeing market conditions for the whole duration of the loan, and to the special conditions prevailing on the financial market, represents a heavier risk for the farmer than does short-term indebtedness. This is all the more evident when we consider the extremely dynamic character of modern economy, characterized as it is by sudden and often very heavy falls in the price of products. An unfavourable turn in the prices of farm products may make it impossible even for a farmer who is free from debt to meet out of his receipts the normal requirements and costs of the farm.

A special form of overindebtedness deserving of mention is that incurred to meet the cost of rural buildings. Their cost depends, as is known, on the stage of development in building technique, on the degree of organization attained by the building material industries, and on the degree of organization of the workers in the building trades. The difference between building costs and the price of agricultural products, a difference unfavourable to the farmer, which may exist at the time of construction, has to be met by loans on which interest will have to be paid for generations. Accordingly high building costs are in many cases the real cause of overindebtedness.

Another form of overindebtedness which of late years has often occurred in connection with the agricultural depression, is that due to the change from one form of farming to another. Given the depression of the prices of certain farm products, farmers have often turned their attention to other branches of agricultural activity. This necessitated the investment of large sums and involved, during the period of transition, the absence of receipts.

Finally, a special form of overindebtedness is that caused by the tightness of the money market due to general lack of confidence and to widespread uncertainty as to the advisability of agricultural investments. In such cases farmers have to apply to the banks for the money they require, for which they have to pay very high rates of interest.

We will not dwell on overindebtedness arising from settlements among the heirs to an estate, a form of indebtedness whose growth has been checked in some countries by the new agricultural inheritance laws, nor will we dwell on a cause of overindebtedness so much deplored in agriculture, that caused by excessively high rates of interest charged on loans, as both these aspects of the question have been dealt with in our previous article to which reference has already been made.

III. — The credit policy of the banks.

In discussions on agricultural overindebtedness and its causes the question is often raised as to the responsibility for this abnormal situation which in many cases has led to the ruin of agricultural estates. An examination of the many reports on agricultural credit during the depression of 1929-32 shows, *inter alia*, that a great number of banks, departing from their traditions of prudent management, were too liberal in financing the farmers during the war and the first post-war years. They made loans to persons who were working at more than normal capacity, and often in good faith they made risky investments. Such loans could no longer be described as normal farm financing operations, but were rather in the nature of commercial credits. On the other hand, the habit had grown up over a period of years of borrowing without measure for all sorts of purposes. In the fat years, numbers of people purchased land and started farming it without possessing the qualities required of a farmer. Moreover among the farmers who had set up on their own account after the war, there were many who started with quite inadequate financial resources. Worse still, the banks had often encouraged this unhealthy tendency. During the years of prosperity money was freely offered to borrowers. The lenders secured very high rates of interest. New banks opened everywhere. High prices acted as a stimulus. In the report on the overindebtedness and disencumberment of Swiss agriculture published by the Swiss Peasants' Secretariat in 1934, the facts we have stated are confirmed. Emphasis is laid on the imprudent way in which credits were granted, the banks being "concerned only with the security given for their investments without regard for their advisability in the interests of national economy. Thus farmers were granted credits to an almost limitless extent, provided they were able to give good security because mortgage investments were considered very safe. If more consideration had been given to lending only what the farm could stand from an economic standpoint, a great number of loans would never have been made". Other writers have expressed much the same opinion on the subject of the excessive lending policy of the banks. With reference to what occurred in 1933 in the Canton of Berne, it has been remarked that credits were granted in too mechanical a manner and that too little care was taken to get at the heart of the matter. Thus, when the borrower could offer a sufficient number of sureties, loans were granted without enquiry being made to see whether the charges exceeded the economic possibilities of the farm.

Likewise, in a report on agricultural credit in Hungary [1] in which reference is made to the breaking-up of large estates, it is noted that at that time the financing of purchases of land by small farmers was lacking in organization. The banks made the loans without due investigation and without first assuring themselves that the borrowers were solvable. Urged by the desire to acquire

[1] CHARLÉS CSÁSZÁR, director of the National Land Credit Bank of Budapest: Le crédit agricole et son action en faveur du développement de la petite propriété en Hongrie. Paper read at the Ist International Congress of Agricultural Credit, Naples, 18-23 October, 1938.

land, the farmers assumed liabilities beyond their capacity to pay. Later on, the banks were compelled to take possession of the land thus purchased. By so doing, the losses of the banks were reduced but the public interest suffered by the fact that a very large area of land thus came to be owned by the banks.

Two conclusions may be drawn from these facts and from others which for the sake of brevity we omit to mention. The first of these conclusions is negative, i. e., that credits were often granted during the period under consideration without adequate caution, thus weakening the financial structure of the agricultural credit institutions and undermining confidence. The second conclusion is positive, i. e. that a prudent and discerning policy on the part of the banks acts as a moderating influence in the field of agricultural credit. For this purpose, banks should be exceedingly circumspect in making loans to farmers. They should never lose sight of the fact that the characteristic feature of agriculture is slowness of production and marketing; that it is the industry most exposed to suffer from natural calamities; that its receipts are seasonal and uncertain; that it cannot count on large profits which can enable it to stand high interest charges, and that when the farmer borrows on conditions which are too burdensome, the loan instead of helping him lands him in bankruptcy.

Therefore an agricultural credit policy should above all things aim at increasing the borrower's productive capacity; and this means that the use to which the loans are to be put should be strictly supervised, and that they must be in keeping with the average returns of the farm and with the farmer's ability to repay them.

Fortunately, if some banks have not always taken into account the special conditions of rural economy, and more especially the low return on capital invested in agriculture, others, more especially public utility banks specialised in agricultural credit transactions, act as a rule in conformity with the principles laid down above.

Apart from those countries in which the several forms of agricultural credit have attained a high degree of perfection and development as the result of long experience, we shall mention another group of countries where agriculture is of prime importance, and indicate certain features which characterize the present organization of their agricultural credit.

In *Rumania*, for instance, the National Agricultural Credit Bank [1], founded in 1937, is so organized that it can postpone the date at which the peasants must settle the loans granted on farm products so as to avoid the need of underselling their crops. The Bank is also required by its statute to enquire into the use to be made of the loan and its advisability. This is very important, as the precarious condition of some of the banks is ascribed to the absence of all control on the use of the loans they have made. The result of careful selection of the applicants is that good farmers can go ahead and purchase land from the incompetent farmers who are no longer able to get credit.

(1) The Act of December 1938 has changed the style of this Bank into Bank for the Industrialization and Development of Agricultural Production.

In *Bulgaria* since 1935 the Agricultural and Cooperative Bank has introduced a new method of farm financing, according to which a preliminary study is made of the amounts to be lent. In ascertaining the solvency of applicants for loans the Bank takes into consideration not only the estate, but the nature and yield of the crops. Acting on this system the Bank has reduced the credit to doubtful farms and to those offering certain risks even if they afford adequate material security. The whole policy of the Bank is now directed towards encouraging the gradual increase in the productivity of national agriculture. Thus the Bank is helping not only to raise the productivity of the farms, but to consolidate them, thus rendering the loans themselves more liquid. Henceforth loans will be granted to the extent corresponding to the real needs of the farmers in such a way as not to endanger their economic and financial position.

The Agricultural Bank of *Greece*, founded in 1929, acts on similar lines and only makes loans on specially favourable conditions to farmers if they undertake to use the improved methods of cultivation recommended by the Bank or carry out the agricultural plans it has laid down.

To avoid the drawbacks of ill-regulated credit, some countries have encouraged the foundation of special banks placed under Government control. A notable example of this policy is afforded by *Hungary* where the Government had to solve two closely interrelated problems, namely, that of making part of the large estates available for small holdings (agrarian reform) and that of the provision of agricultural credit facilities. As long experience has shown, it is not wise to leave to the judgment of the small farmers the conditions on which they purchase land and secure the loans required for that purpose, as the desire to acquire land is so strong in Hungary that the farmer, however sensible he may be, easily gets involved into excessive liabilities. Under these conditions the Government has had to interfere to an ever greater extent with the subdivision of estates and the credit transactions to which such subdivision gives rise. If the banks were willing to make loans to purchasers of land, the Government could not allow them to be the sole judges of the satisfactory nature of the conditions on which they made them. These considerations led to the enforcement of strict supervision by the authorities of the subdivision of private estates, so as to control the price of land and the conditions of purchase. Moreover, the Government has given financial support to the land-banks, enabling them to lend on favourable terms for the purchase of land by small farmers. Thus the land-banks and the Government itself make a careful investigation into the economic resources of the borrowers so as to prevent them from undertaking excessively heavy liabilities.

To ensure the application of rational principles to the distribution of agricultural credit in *Italy*, the banks authorized to engage in this branch of business have provided themselves with special offices placed under agricultural experts, doctors in agricultural sciences, etc., who study the applications for loans so as to make sure that the capital invested in the land be so used as to secure higher returns by the adoption of suitable methods of farming. Loans are only allowed when a careful study has been made of all the results likely to be secured. The procedure followed in granting land-improvement loans is of special interest. In such cases the

borrowers when making their application are required to supply accurate statements accompanied by plans and estimates showing the proposed use to be made of the loans; when the plan is being carried out the payment of the loan is made in several instalments along with the progress of the work, which is followed closely by the banks. Before paying the final instalments, the bank has the right to have final inspections made so as to make sure that there has been no waste of money and that there have been no irregularities or imperfections in the execution of the work. Loans made for the purchase of small holdings are the subject of special precautions; the law requires that the applicants should have some means of their own, so that when they have acquired the holding they may be able to keep it in good working order. Such loans are treated by the law as agricultural improvement loans, and are accordingly entitled to a Government grant in part payment of interest charges (2.5 per cent.).

The policies adopted for the distribution of credit by the central agricultural credit banks which have been founded of recent years in several countries are inspired, as we have seen, by the desire to prevent farmers incurring liabilities in excess of their ability to pay. With this end in view, attention must be paid not only to the amount of the debt and to the conditions of repayment, but also to the purpose for which the loan is made. An examination of the reports of the central agricultural banks in the countries of Eastern Europe often shows that prior to the recent reorganization of their credit systems, a large percentage of the loans granted were for purposes of consumption. Now, consumption credit cannot produce the means required for the repayment of the debt. It sometimes represents unavoidable expenditure for meeting the domestic needs of the farm, food, clothing, heating, etc., but these commodities have to be paid for out of the income of the farm which becomes insufficient for needs, and the financial position of the farm is thus compromised. Consumption credit should therefore be refused if overindebtedness as crushing as it is absurd is to be avoided. The first condition for the rational use of agricultural credit is that it be used for productive purposes. In the case considered, the loan is not productive.

We have tried to call attention to the important part the banks are called on to play in the rational distribution of credit, a part which can really help in avoiding the return of the critical situation described above.

We should also note the opinion expressed by eminent authorities who consider that the best way of avoiding the overindebtedness of farmers is to be found in the development of general credit institutions which would advance the amounts they need to upright and industrious borrowers at moderate rates of interest. Several countries have endeavoured to secure this end by encouraging and facilitating the foundation, by the parties concerned, of mutual credit societies which afford cheap credit to their members; it is essential that they should follow closely the situation of each farmer so that the credit allowed him be in keeping with his needs and with his real capacity to pay. It would therefore be desirable that these institutions should develop on a still larger scale in all countries, more especially in those where farmers have difficulty in securing credit and can only get it at exces-

sively high rates, with the result that they are crushed by liabilities disproportionate to the receipts obtained from their farms which they are frequently obliged to sell in order to pay off their creditors, thus either becoming agricultural labourers or having to leave the land.

In conclusion, it may be said that a sound credit policy followed by the farm financing institutions can be of great help in preventing excessive indebtedness.

IV. — The intervention of the public authorities.

Whatever the causes, general and specific, of farm overindebtedness, whatever the mistakes committed by the borrowers who in periods of prosperity are inclined to incur unreasonably heavy debts, whatever the mistakes of the creditors who are sometimes too ready to grant loans, all agree that excessive indebtedness is a common and general evil. One of its most alarming and depressing effects is, as we have already pointed out, the foreclosure of mortgages which not only causes the price of land to slump, thus givig rise to widespread disturbances, but, what is still worse, leads to the sudden displacement of whole classes of agricultural producers by persons who frequently are strangers to agriculture. Evidently the cost of such displacements cannot be estimated exclusively from the standpoint of material loss. We must not forget that the farmer is bound to his land and to his occupation by solid and deep-rooted bonds, that farming is for him not only an occupation but a traditional mode of life, and that the state of mind of a farmer who is suddenly dispossessed of his land as the result of speculative manœuvres is socially dangerous. It is therefore easy to understand the efforts made by several public institutions and by certain Governments for preventing, by appropriate measures, the creation of overindebtedness. The means used toward this end are sometimes indirect, sometimes direct.

In the field of government action, the surest indirect method for acting towards this end consists in adopting a price policy which ensures a fair return to the farmers. The most effective, if not the simplest, means of putting a stop to an abnormal farm credit situation is to support the prices of farm products, thus enabling the farmer to pay his debts, provided that a simultaneous rise in the cost of means of production is avoided, as otherwise the benefit contemplated would be cancelled. Almost all the measures taken by Governments since the last economic depression have indeed aimed at improving, as far as possible, the price situation on their respective markets [1]. They have endeavoured to do so by setting up systems for protecting farmers against foreign competition, by improving the marketing of farm products, and more especially by regulating production so as to balance supply and demand on their respective markets. But the chief purpose should be not so much to assure high prices to the producer as to secure the stability of prices. The reader will remember that it was the sudden

(1) The details of this policy have been systematically described in the volumes THE WORLD AGRICULTURAL SITUATION, published each year by the International Institute of Agriculture from 1929-30 to 1938-39.

fall in prices caused by the fundamental disparity between the volume of the goods offered and the volume of goods for which there was a demand, which in 1929-32 led to the unprecedented agricultural breakdown. Stabilised prices, by avoiding those ups and downs so injurious to normal business, enable farmers to work under peaceful and remunerative conditions. It must be admitted that the incomes of the farmers and their purchasing power have really improved as the result of stable and remunerative prices secured by government intervention. The practical value of this policy as a means of reducing indebtedness is therefore generally recognized.

Other indirect measures taken by some governments to prevent excessive indebtedness which have proved very effective are those which have taken the form of technical and financial help, more especially on behalf of small farms. One of the most striking examples is that afforded by the *Netherlands*. As is known, small holdings play an important part in the agriculture of that country. They therefore required protection, and in 1934 it was decided to set up a special service which started work on 1st November 1937. Every small farmer receives information and advice from the assistants of the Board of Agricultural Advisors who direct the service. Each assistant has a very small number of farmers placed under his supervision. The small farmers are divided into three groups: (*A*) those who are regularly employed in the service of others; (*B*) those who work mainly on their own, but whose farms do not afford them full occupation and who therefore seek intermittently for work on the larger estates; (*C*) those who have a small farm which takes their whole time but who in periods of depression do not earn enough to live on. Now, on condition that they follow the advice given them by the agricultural advisors, farmers belonging to group *B* receive each week a cash allowance, and those belonging to group *C* receive tickets which entitle them to greatly reduced prices for, and in some cases to the free distribution of, farm requisites. The cash allowance varies inversely with the receipts of the farm and directly with the size of the family. The purchase orders are given after the amount of fertilizer or feeds required has been estimated by the assistant of the Service or when he has ascertained that the farm requires the use of certain machinery or implements.

Of like character is a special form of assistance introduced by Royal Order in *Sweden* on 7th June 1940, consisting of relief loans to farmers involved in economic difficulties. Such loans are only granted if the difficulties arise from the farm, if the farmer has no other means of securing a loan on reasonable terms, and if as a result of the loan he is likely to be able to carry on his work successfully. The amounts loaned may nor exceed 800 crowns per hectare, nor 40 per cent. of the value of the borrower's estate, and may not amount to more than 10,000 crowns. No interest is charged during the first two years; subsequently, the borrower pays 4 per cent.; at the end of the fifth year he is required to repay the loan in instalments of 1/15 per annum.

In *Finland*, in order to provide credit facilities for small farmers, the Government founded in 1921 a " Bank for the assistance of agricultural production ". A law and a decree in its regard promulgated in 1938, laid down detailed instruc-

tions for the grant and use of the loans. They may only be made to farmers owning not more than 15 hectares of arable land and whose financial situation is such as to make such a loan strictly necessary. Loans may be made for clearing fields and grass lands, for improving the soil, for erecting or repairing buildings, and for the purchase of machinery. The loan may not exceed 60 per cent. of the estimated cost of the work to be carried out or the machinery to be purchased. No more than 30,000 F. Marks can be allowed to the same borrower. During the five years period 1939-42 the interest charged may not exceed 4 per cent. The loans are repayable in 5 to 20 years.

Many who have closely studied the problem of overindebtedness as affecting more especially small holdings are of opinion that in their case the best solution would be to afford opportunities for work rather than to land money. It would therefore seem highly desirable that ancillary industries should be started to supply additional earnings in districts where small holdings are numerous. The experience acquired by many countries in this matter shows that this view is well-founded.

Besides the two means for avoiding overindebtedness to which we have just referred, there are others whose action is still more immediate. They have been applied on a large scale, for instance in *Switzerland*, a country of small peasant holdings which is very interesting from this point of view. Several kinds of institutions have been started there for the protection of small farmers. We will refer to them briefly.

The " Financial Surety Bank for agricultural workers and small peasants ", founded in 1921 by the Swiss Peasant's Union in Brougg, enables agricultural workers and the sons of small peasants to acquire a farm by replacing individual surety by that afforded by a bank managed and directed with a view to the general utility. When a farm is purchased the bank goes surety for the credit accounts opened in favour of the purchaser. Only applicants who have good references, who seem able to work the farm themselves, and who have been employed uninterruptedly for at least ten years in agriculture, can secure the help of this bank, which can only go surety when it has reasoh to believe that the farm the applicant wishes to acquire will enable him to earn a livelihood. All applications from candidates who can satisfy these conditions are examined on the spot, and the manager of the bank with the assistance of an expert visits the farm and estimates ist production value. The Bank has always made a point of informing intending purchasers of the danger of paying too high a price for land and endeavours to prevent excessive prices being paid. Borrowers must undertake: (*a*) to repay the capital for which the Bank is surety in conformity with a plan of amortization which takes into account the special conditions of each case; (*b*) not to give surety for others until the Bank has been fully repaid; (*c*) not to pledge their cattle without the consent of the Bank; (*d*) to keep a ledger in which are entered all farm and household receipts and expenditure. Candidates who purchase a farm are generally required to give a lien on the land as security for the amount for which the Bank is surety. This institution is therefore auxiliary to the action taken to avoid the payment of excessively

high prices for land and the ill-considered purchase of farms which may give rise to overindebtedness. In the period from 1921-22 to 1940-41 the Bank has received 6,860 applications and has approved 715; 603 contracts of surety have been signed for a total of 3,645,026 francs [1].

While the Financial Surety Bank comes to the assistance of beginners to enable them to make for themselves an independent position on fair conditions, the purpose of the " Relief Fund for small peasants, indebted farmers and agricultural workers " is to save from ruin small farmers who are in debt. Since 1928 the Swiss Confederation has placed 400,000 francs at the disposal of this Fund. Thanks to this grant and to the repayments made by the beneficiaries, the help given amounted on 30th June 1941 to 409,421 francs. The foundation of this Fund in 1923 was the starting point for the assistance given to distressed peasants through the agency of the Relief Banks, the need for which became particularly urgent ten years later.

The foundation of the " Relief Banks for Distressed Peasants " was approved by the Federal Order of 30th September 1932 on temporary financial assistance to agriculturists in difficulties. Under this order and similar orders issued later on, credits were opened by the Federal Council for this purpose. The Cantons are required whenever possible, to make a grant for a like amount to that allowed by the Confederation. Under the order referred to the assistance given is limited to families deserving of help and on condition that a permanent rehabilitation of their situation is reasonably assured. The grant of relief must be preceded by a thorough enquiry made by qualified persons. Help must be given more especially in the form of advances for interest payments, in loans with or without interest charges, or in cash subsidies. It is subject to certain conditions, the fulfilment of which insures the permanent rehabilitation of the farm. Special mention should be made of the provision under which the owners of the farms may not incur new interest bearing debts without permission. The relief work is assisted by a farm management advisory service. This and similar measures subsequently taken, are carried out by the Cantons who can entrust the work either to new institutions or to existing ones [2]. In nearly all the Cantons, Relief Banks have been opened for this purpose which act in conformity with the principles stated. Up to 1937 the Confederation and the Cantons had appropriated for this form of financial assistance a sum of nearly 43 million francs. In the 4,400 cases recorded in the statistical returns the relief grants made by the Banks have amounted to 9.5 million francs.

The Agricultural Debt Amortization Bank of the Canton of Fribourg was officially authorised by a decree of the legislative body of the Canton under date of 30th July 1935. It should be noted that several districts of this Canton suffer

(1) See: VINGTIÈME RAPPORT DE GESTION DE LA CAISSE DE GARANTIE FINANCIÈRE POUR OUVRIERS AGRICOLES ET PETITS PAYSANS, 1st July 1940 - 30 June 1941, and DOUZIÈME RAPPORT SUR L'ACTIVITÉ DU CONSEIL DE FONDATION DU FONDS DE SECOURS POUR PETITS PAYSANS, AGRICULTEURS OBÉRÉS ET OUVRIERS AGRICOLES, 1940-41. Brougg, 1941.

(2) The latest of these measures is the Federal Order prolonging and amending the temporary legal measures taken for the protection of distressed farmers, dated 11th December 1941. See: *Recueil des Lois fédérales*, No. 59. Berne, December 11, 1941.

severely from overindebtedness. The purpose of the Bank is therefore that of economically rehabilitating the overindebted farmers who are deserving of help, but only when the permanent rehabilitation of the farm can be achieved. Among other provisions the decree above mentioned requires that the Council of State issue laws to prevent the further indebtedness of rural property. The Bank is financed by the Cantonal government and by subsidies from the Confederation.

The three kinds of institutions we have just described have been very successful; they can therefore serve as examples for countries desirous to create an organization for consolidating the economic position of the peasant proprietors.

Modern agrarian policy is unanimously of opinion that the encumbrance of farms should be controlled not only by the law on contracts, but also by the inheritance laws. It is indeed well known that the financial arrangements in connection with succession to landed property may lead to heavy indebtedness. To avoid this, in countries where the legal or customary system of the undivided transfer of farm property to a single heir prevails, rules have generally been adopted regulating the mode of appraising the farm itself with a view to determining the compensation due to the co-heirs. For this purpose the income value of the farm is generally accepted as the basis of appraisement. This system is in use in Germany, Norway, Switzerland, etc. (1).

We have just described some of the means devised for the indirect prevention of overindebtedness of farms. Such indirect methods are perhaps those best suited to deal with so complex and delicate a situation which has far-reaching effects upon the machinery of credit and affects a whole series of interests. Mention however must be made of the fact that some countries have gone much further and have taken direct measures to control the phenomenon with which we are dealing. We refer to Germany, Switzerland, and to some extent Italy.

In *Germany* the Act of 1st June 1933 regulating the conditions of agricultural indebtedness, introduced a principle of great interest for the subject we are studying, that of accepting the surety limit of trustee investments (*Mündelsicherheitsgrenze*) as the maximum allowed for mortgage liabilities incurred, which had therefore, as a rule, to be reduced to two thirds of the taxable value of the estate.

Subsequently, with a view to the protection of the peasantry, the Act of 29th September 1933 (*Reichserbhofgesetsz*) created a special legal status for the *Erbhof*. Consequently hereditary peasant holdings are protected in their entirety and withdrawn from the market. Such holdings cannot be mortgaged; any exceptions to this rule must be approved by the special courts (*Anerbengerichte*) set up under the Act. Peasant holdings cannot therefore be foreclosed or distrained on behalf of creditors. They can only be sold with the consent of the *Anerbengericht*. All this is derived from the new idea of value which prevails in German agriculture, in accordance with which farm land is no longer considered as saleable merchandise but as affording the basis for the work and livelihood of the farmer.

(1) See M. TCHERKINSKY: The Evolution of the System of Succession to Landed Property in Europe. *Monthly Bulletin of Agricultural Economics and Sociology*, June, 1941.

In *Switzerland* where, as in many other countries, agriculture is suffering from heavy indebtedness, especially due to mortgage debts, a radical measure has been adopted by placing a limit on liabilities incurred. The matter is regulated by the Order of the Federal Council for preventing speculation on land values and overindebtedness and for the protection of farmers, dated 19th January, 1940 (1) and amended by another Order of the Federal Council dated 7th Novembre 1941 (2). To start with, we should note that the two matters of land speculation and overindebtedness have very properly been considered together. It has long been recognized in Switzerland that one of the chief causes of overindebtedness is to be found in the free market for real estate which has led to unduly high prices for land and consequently to the indebtedness of the purchasers. Thus one of the preventive measures which is considered most effective consists in the control of transactions in land.

The provisions against overindebtedness can be summed up as follows (3). Real estate used for agriculture or forestry undertaking and covering separately or jointly an area of not less than one hectare, may not, with some exceptions, be encumbered with mortgages or other liabilities secured on them without the consent of an officer appointed by the Canton.

Consent may be refused if the liability to be secured on the land exceeds its appraisal value based on its yield, i. e. on the amount which has on the average been obtained by farming it in conformity with local conditions for a certain period (30 years) preceding the valuation, capitalized at the rate of 4 per cent. This yield value, increased by not more than 25 per cent, is the appraisal value in the meaning of the Act. The additional 25 per cent. is justified, as experience shows that some factors must be taken into consideration which are not shown by the yield itself, such for instance as the particularly favourable position of the farm, the condition of the buildings, and the technical fixtures.

As soon as application is made, the authorities responsible enquire whether the encumbrance to be placed on the land is one which requires their consent or not. In the affirmative, they enquire whether there is danger of overindebtedness and if that danger can be avoided forthwith, he gives his consent at once. If the danger cannot be avoided forthwith, the officer orders a special appraisement of the property, the result of which is entered in the land register. At the end of each five-years period the owner may ask for a revision of the appraisal. Should the value of the property be greatly modified, as for instance by land improvements, buildings, important alterations or lasting depreciation due to natural causes, a new appraisal may be asked for during the interval (4).

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(1) *Recueil des Lois fédérales*, No. 4, 24th January 1940.

(2) *Recueil des Lois fédérales*, No. 53, 8th November 1941.

(3) See Robert Haab, professor at the Basle University: Le désendettement de l'agriculture en Suisse. *Bulletin international de Droit agricole*, No. 4, 1941. International Institute of Agriculture. Rome.

(4) On the study made by the Swiss Peasants' Union on agricultural disencumberment and on the measures it has drawn up for solving the problem, see: Le désendettement de l'agriculture suisse et la consolidation de la propriété foncière paysanne. Requêtes de l'Union des Paysans Suisses aux autorités fédérales. January 1935. Brougg.

In *Italy* a maximun for mortgage liabilities has not been introduced as in Switzerland but, as already pointed out, the special agricultural credit banks act with the greatest prudence in the matter of mortgage. Moreover, the new code of civil procedure makes important innovations as regards pledges on farm stock. They are based on the need of protecting the farm as a whole in the interest of production, avoiding as far as possibile the removal of anything which is of use in working the farm. The said code provides that the chattels which the owner keeps there for working the farm may only be the subject of separate pledges in the absence of other pledgeable personal property. But the most important innovation consists in the fact that the Court is empowered, at the request of the debtor, and after hearing the creditor, to exclude from the pledge by an unappealable order, chattels considered indispensable for the cultivation of the holding. Thus in Italy also the law tends to limit the right to pledge rural property.

V. — Conclusions.

We were induced to complete the study published in 1937 on agricultural indebtedness by this further study on overindebtedness not only by reasons of a systematic nature, but also by practical considerations, as at the present time the monetary developments and the speculation noted in that previous period are again recurring and might, under certain circumstances, lead to the renewal of a credit situation similar to that which occurred in connection with the economic depression of 1929-32. Such phenomena, closely connected with the war, are partially of material, and partially of a psychological nature. Both factors combine and act together, thus contributing to give rise on the real estate market to an abnormal situation which may prove very injurious to agriculture. The first group of phenomena noted consist in the exceptional liquidity of the capital market, due to the huge mass of means of payment now in circulation and to the high war profits obtained by certain groups of producers, accompanied by forced limitation of consumption and leading, therefore, to the formation of large masses of savings. The second group of phenomena find their expression in speculation caused by the uncertainties of the moment, which takes the shape of a rush towards investments in real estate as a " sheltered investment " for money. Many indeed try to invest their large savings in real estate purchased at prices out of keeping with the income which can be obtained from the property. In most cases the purchasers are manufacturers, traders or other strangers to agriculture, who are willing to buy any land regardless of its location, of the crops grown on it, of conditions under which it can be worked and of the returns obtained. Now, it is easy to foresee how, this time, as after the last world war, the period of inflation and swollen prices will be followed by deflation with the accompanying phenomena of tight money and limited business activity. It is therefore very likely that at a certain moment the credit relations which have arisen during the inflation period of seeming prosperity will become excessively burdensome when prices fall and when it will be difficult to recover debts. The fear of the renewal of such a state of affairs explains the steps already taken by some Governments to prevent, *inter alia*, the speculative purchase and sale of land. But

if the intention of preventing overindebtedness, which has made itself clearly felt of recent years, can be explained by the need of preventing the serious financial and social consequences to which it gives rise, yet another order of considerations helps to justify the tendency which is making itself felt. Under a system of government planning, agricultural producers work, so to speak, in direct collaboration with the Government in carrying out the new agricultural policies which lead to a planned economic organization of agriculture. The farmers are urged by diverse means, optional and compulsory, of a more or less comprehensive nature, to conform to the new policies. The ultimate purpose is to adjust the supply of products to the demand, so as to avoid harmful disparities and satisfy adequately the needs of each country both in respect of home consumption and, if need be, of export. The farmers are thus assured prices which cover production costs and leave a fair margin of profit, encouraging at the same time a more equitable distribution of the national income among the several classes which contribute to its production. For this purpose a new form of direct financial assistance to farmers has been devised and has developed on a large scale in Great Britain, the United States, Italy, the Netherlands etc. (1). By this means, agricultural producers are compensated for any losses they may incur in carrying out the new agricultural policies which often require them to enlarge or limit the area under certain crops, an action which may involve the farmers into financial losses, which should be compensated. All this is evidently in the general interest of the nation. The farm has thus become an instrument of government policy and it must therefore be protected not only against the danger of soil deterioration, excessive subdivision of the land, etc., but also against the risk of excessive indebtedness. Otherwise, the productive activities of the farm would, in the long run, be paralized to the injury of the whole community. This same need has given rise to the many measures taken to assure the indivisibility of the minimum farm units, for the consolidation of subdivided holdings, etc. Overindebtedness indeed hinders the normal working of the farm, as by absorbing a large part of the returns for the payment of high rates of interest and amortisation, the working capital of the farmer, required for the purchase of fertilisers, sprays, machinery etc. essential for increasing crop yields, is reduced. If therefore the farm, as the primary instrument of production, is to be protected, a limit must be placed on the farmer's rights to encumber it with debts. We have already seen how both these principles are applied. The agricultural and social structure of the several countries will point the best way to follow.

The studies already made for a reform of this description, the measures already taken toward that end, and above all the results so far obtained, show that this new policy is sound and useful for both the individuals and the community. On the other hand, this reform fits in logically with the system of planned economy now so largely introduced and which will probably last for a long time to come. On the other hand, the fear that the legal limitation of indebtedness may limit farm credit

(1) See our article « Direct Financial Assistance to Farmers within the Framework of the Regulation of the Markets ». *Monthly Bulletin of Agricultural Economics and Sociology*, No. 2, February, 1942.

would seem to be unjustified, as evidently land which is moderately encumbered affords much better security than land which is overindebted. The former has a better chance of recovery and affords a wider margin of safety, whereas the latter represents a serious risk for the banks, especially in periods when a sudden fall in the price of products is followed by the depreciation of real estate. Loans in this case remain uncovered, to the serious injury of the banks. It would therefore seem desirable in their interest also to place a limit on the mortgage indebtedness of farm property. The farmers, when protected against the risk of ruin, will be all the better able to discharge their functions in the national interest.

In the countries where an organized mortgage credit market exists, it is mostly in the hands of public law corporations which act in conformity with traditional principles, only granting loans on first mortgages and as a rule for amounts not exceeding 50 per cent. of the appraised value of the estate, these loans being repayable by annual quotas, and at moderate rates of interest. A well-known typical example of agricultural land credit corporations which are well organized and successful in their work is afforded by the German *Landschaften*. Similar institutions in other countries have been modelled on them, among which the Federal Land Banks of the United States. By applying to such corporations, the farmers can avoid excessive indebtedness. But it should not be forgotten that in countries where such organizations do not exist, the bulk of mortgage business is transacted by private persons through the agency of notaries; it therefore escapes public control, and may give rise to serious abuses to the injury of the farmers. It is in such cases that it would be desirable to place a maximum legal limit on mortgage loans.

This requirement, while it may seem logical for farms in general, is all the more so in the case of small holdings, which form the great majority of farms and whose existence should therefore be safeguarded as of essential importance to the health of the social body. It seems strange that while in many countries the formation of small holdings has been encouraged by credit facilities, the supply at reduced prices of the means of production, the promotion of various forms of agricultural co-operation, with few exceptions nothing has been done to preserve the integrity and stabilize and perpetuate the working of such holdings. The measures for limiting farm indebtedness above described have precisely this end in view.

INTERNATIONAL CHRONICLE OF AGRICULTURE

UNITED STATES.

CONTENTS: 1. General situation. – 2. Agricultural prices and costs. – 3. Cash receipts of the farmers. – 4. Agricultural production and marketing.

1. General situation.

The agricultural situation in the United States underwent a notable change in the course of the year 1941. During the preceding year 1940, the heavy fall in agricultural exports due to the closing of European outlets exercised a depressing influence upon the market of the principal agricultural staples. The farmers were thrown back

upon the home market, and if, in spite of the diminution in exports, the agricultural situation was generally satisfactory, this was entirely due to the marked increase in domestic demand of agricultural products caused by the war-time expansion of industrial activity and the consequent increase in the purchasing capacity of the consumers. This improvement in domestic demand, however, did not, on the whole, benefit the producers of the great export staples, such as wheat, cotton, tobacco and some other commodities, which could, under no conditions, be disposed of at home. They had to be helped by the Government under the Agricultural Adjustment Act and by the various measures designed to absorb unmarketable surpluses of agricultural products.

It may, indeed, be said that, in 1940, and up to the spring of 1941, the agricultural situation in the United States was determined by the continuous and rapid increase in domestic demand, due to the expansion of industrial activity under the defence programme, which made good the heavy losses suffered by the branches of agricultural production largely dependent upon exports. In fact, it has been officially estimated that, at the beginning of 1941, the exports of United States farm products had fallen to the lowest level in 74 years, thus declining to a figure at which they stood on the morrow of the Civil War. The fall was so heavy because not only the continental European markets were shut off, but the United Kingdom, the largest single importer of American agricultural products, diverted most of its buying of foodstuffs to Empire countries, with a view to saving all the available dollar exchange for the purchase in the United States of armaments.

In 1941 the situation in this respect changed radically. In April 1941, the Congress set aside 1,350 million dollars out of the 7,000 dollars appropriation under the lease-lend programme, for the purchase of agricultural products and other necessaries in the United States, thus placing at the disposal of the British Government large sums for the payment of foodstuffs and other commodities. Later in the year, another 1,875 million dollars appropriation for the same purpose was added to the original amount. Large purchases were effected, and as, at the same time, the carrying-out of the defence programme was speeded up, and large Government purchases of foodstuffs and other agricultural products were made for military stores, the year 1941 became a boom year for United States farmers.

As statistical information bearing upon the movement of foreign trade in the United States during the second half of 1941 is not at present available, no figures showing the increase in agricultural exports can be given, but from official statements it is known that it was sufficiently large to produce a change in the whole situation. The continuous increase in domestic demand, due to the expansion of industrial activity in the United States, is illustrated by the following figures:

Index numbers of industrial production and of the income of industrial workers in the United States.

	Industrial production (1935-39 = 100)	Income of industrial workers (1924-29 = 100)
1937	113	94
1938	89	73
1939	108	84
1940	123	95
1940, 4th quarter	134	104
1941, 1st »	144	112
2nd »	152	124
3rd »	161 (July–August)	138

2. Agricultural prices and costs.

The increase in the demand for foodstuffs and other agricultural products for domestic consumption and for export under the lease-lend programme was reflected in the movement of agricultural prices which all rose more or less, the rise in some commodities being very pronounced. Our data cover the first nine months of 1941, but the rise must certainly have continued since, and has probably become more marked, the more so that, with the continuous increase in expenses on the defence programme, inflationary factors were bound to exercise a growing influence upon prices. The evolution of prices of the various groups of agricultural products can be seen from the table below.

Index numbers of prices received by farmers.
(August 1909 – July 1914 = 100)

	Grains	Cotton & cotton-seed	Fruits	Truck crops	Meat animals	Dairy products	Chickens & eggs	All groups
1937	126	95	122	123	132	124	111	121
1938	74	70	73	101	114	109	108	95
1939	72	73	77	105	110	104	94	93
1940	85	81	79	114	108	113	96	98
1940, 4th quarter	81	79	75	97	112	122	118	100
1941, 1st »	83	81	80	136	130	119	93	103
2nd »	93	98	92	151	140	124	110	113
3rd »	101	133	94	136	159	136	133	128

Both the growing needs of the expanding armament industries and the incipient inflation brought about a general rise in the prices of commodities and services, which had an all-round effect upon the costs of production. In agriculture, however, the evolution of the relations between prices and costs in 1941 was, on the whole, favourable to the producers.

The general index numbers of wholesale prices (1910-14 = 100), rose from 116 in the last quarter of 1940 to 118 in the first, 124 in the second and 132 in the third quarter of 1941. As to the prices of the commodities bought by the farmers for their households and their farms, they increased considerably less than the general level of prices, the advance in the cost of the means of production being particularly small. Thus, between the last quarter of 1940 and the second quarter of 1941, which is the latest date for which information is available, the index of prices of household goods bought by the farmers rose from 122 to 129, while that of the means of production advanced only from 125 to 128. The increase was particularly marked in food, feeding stuffs, automobiles and tractors, building materials and certain minor items, such as containers, etc.

Of all the items of cost the largest increase was registered in farm wages, their index (1910-14 = 100) having risen from 124 in January to 138 in April and 160 in July 1941. This increase, partly owing to seasonal causes, was mostly due to the rapidly growing demand for man-power by both industry and the expanding armed forces.

According to a preliminary estimate made in October 1941 by the Bureau of Agricultural Economics, the total costs (1) of agricultural production in the United States

(1) Exclusive of interests on famers' own capital.

in 1941 should have risen by about 15 per cent. over the 1940 figure. In the balance of United States agriculture for 1941 this increase, however, is more than compensated by a considerably larger increase in the gross income from farming (1) which is estimated to have risen from 11,014 million dollars in 1940 to 13,500 million dollars in 1941, an increase of about 19 per cent.

3. Cash receipts of the farmers.

According to preliminary estimates made on the basis of the data for the first nine months of the year, the total cash receipts of the farmers in 1941, including Government payments, should work out at about 11,200 million dollars, compared with 9,120 million dollars in 1940, 8,540 million dollars in 1939 and 8,072 million dollars in 1938.

For the first nine months, January to September, 1941, the cash receipts of the farmers in the United States, according to their sources, were as follows:

Cash receipts of United States' farmers from marketing and from Government payments for the first nine months of the years 1940 and 1941.

	January-September 1940	January-September 1941	Increase or decrease, in per cent.
	Million of dollars		
TOTAL INCOME FROM MARKETING	5,648	7,299	29 per cent.
All crops	*2,201*	*2,840*	*29* »
Grains	787	940	19 »
Cotton and cottonseed	192	460	140 »
Fruits	291	356	22 »
Vegetables	505	570	13 »
Tobacco	142	186	31 »
All livestock	*3,447*	*4,459*	*29* »
Meat animals	1,677	2,259	34 »
Dairy products	1,137	1,385	13 »
Poultry and eggs	514	667	29 »
GOVERNMENT PAYMENTS	541	391	—28 »
Total income including Government payments	6,189	7,690	24 »

It would appear from the above table that, during the first nine months of 1941, the farmers' cash receipts from marketing have increased 29 per cent., while in the receipts from Government payments there has been a diminution of 28 per cent. This change in the composition of the farmers' receipts, though in itself characteristic of an improvement in the conditions of agriculture in the United States during the period under review, is, however, somewhat exaggerated, as in 1941 Government payments to farmers under the Agricultural Adjustment Act were generally effected at later dates than in 1940, and, therefore, part of the sums which, in 1940, figured in the first nine months' account, now were not yet paid. Accordingly, the official estim-

(1) Exclusive of changes in inventories.

ate of the total receipts for 1941, based on the first nine months figures, puts the estimated receipts from marketing for the whole year about 26 per cent. above those of 1940, and the Government payments about 100 million dollars below the amount paid in 1940, which would represent a reduction of approximately 11 per cent.

4. Agricultural production and marketing.

Agricultural production policy. — Though the year 1941 can be described as a year of agricultural expansion in the United States, the Federal Government's policy in respect of production remained, on the whole, rather conservative, and gave no encouragement to an all-round increase in agricultural output. Indeed, it had to reckon not only with the need to avoid an unchecked expansion, with all its painful and dangerous aftermath, but also with the very precarious position of certain branches of farming, largely dependent on export, such as wheat, cotton and tobacco among the principal crops, whose production it was vitally necessary to keep down, while helping the producers to survive the depression of demand due to an exceedingly heavy diminution of exports.

Accordingly, the Agricultural Adjustment Act of 1938, as well as all the machinery created for the absorption of surpluses, not only remained in force, but continued to operate. The acreage allotments for 1941 remained practically unchanged at the same figures as those for 1940, except for slight adjustments in the case of peanuts and of certain grades of tobacco mostly for domestic use, which were raised to meet the expansion of demand due to the increase in the purchasing capacity of the consumers.

Below we shall give an outline of the situation with regard to the principal agricultural products in 1941, as well as the outstanding features of the programme for 1942, as worked out at the beginning of the 1941-42 campaign.

Wheat. — The wheat situation in the United States since the beginning of the European war was rendered exceedingly difficult by the closing of the European markets. The stocks of home-grown wheat in the United States, which amounted to 81.3 million bushels in July 1939, increased to 87.3 million bushels in July 1940, and reached the very large figure of 151.9 million bushels in July 1941. The acreage allotments for wheat, first introduced for the 1939 crop, which was considerably reduced compared with 1938 (from 79.6 to 64.4 million acres), remained unchanged at 60 to 65 million acres for the 1941 crop. Production in 1941 reached 945.9 million bushels, compared with 816.7 million bushels in 1940 and 762.4 million bushels on the average for the period 1935-1939. The market was glutted, and the prices were kept up, at a figure about 25 cents per bushel above the level of wheat prices on the world market, by the liberal application of commodity loans under the A. A. A. As a result, during the 1941-42 campaign, the Federal Government, for the first time, has had to apply marketing quotas to wheat. Moreover, the acreage allotments for the 1942 wheat crop have been drastically reduced, being fixed at 50 to 55 million acres.

Maize (corn). — The situation of the corn market, as well as that of the other fodder cereals, was good in 1941, owing to the steady expansion of animal production in its different branches. There has been a considerable advance in all feed prices, and the future prospects were good, seeing that the prices of livestock and of animal products advanced at a faster rate still. Thus, the corn-hog ratio was favourable to the expansion of hog breeding. The demand for hogs and hog products was increasing, both on the domestic market, where the consumption increased with the expansion of the purchasing capacity of the consumers, and for export under the Lease-Lend Act. Thus, though the stocks of maize (corn) in the United States on the 1st July 1941 were large, and amounted to 53.1 million bushels, compared with 25.4 million bushels in July

1940 and 30.9 million bushels in July 1939, the position of the corn market was generally good, and the acreage allotments, which were from 88 to 90 million acres in 1940 and 1941, remained practically unchanged (87.5 to 90 million acres) for the 1942 season. Owing to the increase in demand for hogs and the guarantee of hog prices, announced by the Federal Government early in 1941, in the course of that year the producers' prices for hogs were roughly 3 dollars higher than in 1940, and it is expected that a further expansion will take place in breeding, especially in the Western Corn Belt, where the number of hogs had been greatly reduced in the past by droughts. All this permits to expect the relatively easy absorption of the accumulated stocks of corn in the country.

Hogs. — To what has already been said concerning the hog situation in connection with the production of corn, it should be added that, in 1941, the total number of hogs slaughtered amounted to 71 millions, compared with 63.2 millions on the average for 1936-40. The programme for 1942 provides for a further increase in the slaughter of hogs to 79.3 million heads.

Beef cattle. — The number of cattle on farms and ranches has been increasing continually since 1938, and this development was accentuated by the increase in domestic consumption of beef and veal along with the expansion of defence industries and of the armed forces. But the demand being mainly for average and lower grades of beef and veal, the 1941 season was distinguished by a narrowing-down of the margin between the prices of feeder cattle and of slaughter cattle, with the result that feeding up to heavy weight was not profitable. Marketing for slaughter was about 10 per cent. larger in 1941 than in 1940, and was expected to expand considerably in 1942, the total number of cattle and calves to be slaughtered in 1942 being fixed at 28 million heads, as against 25 millions in 1941.

Dairy produce. — The situation with dairy products in 1941 was good, both domestic consumption and exports having increased and prices having improved. The exports of dairy products, reduced to milk equivalents, rose from 700 million pounds in 1940 to 2,600 million pounds in 1941, roughly 80 per cent. of the total shipments being effected under the lease-lend programme. It is expected that in 1942 they will reach 5,400 million pounds, thus more than doubling. Domestic consumption stands in direct relation with the industrial expansion due to the defence programme.

Wool. — The prices received by the farmers and ranchers for wool were the highest for more than ten years in 1941, owing to the great increase in industrial consumption, especially in connection with the defence programme. Wool production in the United States in 1941 constituted a record. The existing stocks of wool, though large, are relatively modest considering the demand for manufacturing uses, so that there is a prospect of a rising market.

Fats and oils. — The consumption of fats and oils is on the increase, owing both to direct demand on the part of consumers of edible oils and fats, consequent on increased purchasing capacity, and to large Government purchases for manufacturing purposes, for the armed forces and for shipment under the lease-lend programme. In 1940-41, domestic production of fats and oils totalled about 9,100 million pounds, and in 1941-42 it is expected to reach 9,400 million pounds, which, however, along with the 1,600 million pounds to be imported, as the maximum permitted by present tonnage conditions, should leave a deficit of over 200 million pounds, to be filled out of the available reserves. The stocks, however, are large, amounting to the equivalent of 2,600 million pounds of oil on July 1, 1941.

Considering the increase in requirements and the restrictions imposed upon imports by the lack of tonnage and other causes, the acreage allotments for oleaginous plants have been increased for 1942. Thus, the acreage goal for soya-beans in 1942 is 7 mil-

lion acres, or 18 per cent. more than the area harvested in 1941. For peanuts it is 3,5 million acres, an 83 per cent. increase on the 1941 area. Cottonseed and linseed acreage allotments remain substantially unchanged.

The index of prices of fats and oils (1924-29 = 100) in August 1941 was 91, compared with 60 in August 1940 and 55 in August 1939.

Cotton. — Since the beginning of the European war, cotton was among the commodities which suffered most from the closing of export markets. In 1941, however, the cotton situation in the United States improved greatly. The prices received by the growers were higher than in any year of the preceding decade. Not only did the Government make the growers commodity loans at the very high rate of 85 per cent. of parity prices, but it bought cotton and cotton manufactures in increasing quantities, thus adding to the growing demand on the part of cotton mills and other private concerns, which reflected the general expansion of business and the increase in the purchasing capacity of the consumers for manufactured goods. The inflationary tendency, which, in 1941, was making itself increasingly felt by the general level of prices in the United States, was also a contributing factor in the cotton situation. Moreover, both the acreage and the yield of cotton in 1941 was somewhat below the average. All these factors more than compensated for the heavy diminution of exports which, during the 1940-41 campaign, amounted to only 1.1 million bales, as against 6.4 million bales in 1939-40, and are not expected to increase in 1941-42. Indeed, while exports are so reduced, domestic consumption in all forms, including the continued use of cotton for relief (such as mattresses for the unemployed and the needy etc.), in 1941-42 is expected to exceed current production, which is provisionally estimated at 10.5 million running bales, thus involving the use of the available stocks. The stocks in June 1941 reached 12.5 million running bales, as against 10.7 million running bales in June 1940 and 12.9 million running bales in June 1939.

The acreage allotment for cotton, which was 27 to 29 million acres in 1941, as well as in 1940, was not reached in 1941, the area actually planted having been only 23.5 million acres. For 1942, the acreage allotment has accordingly been diminished, being fixed at 22 to 24 million acres.

Tobacco. — The tobacco market, which is one of the most sensitive to variations in the purchasing capacity of the consumers, in 1941 reflected the effects of industrial expansion in the United States, thus compensating in part the losses suffered by the closing of export markets. Exports of tobacco in 1941 have, indeed, fallen to the lowest level since the Civil War, and the only improvement that can be expected has to come from lease-lend shipments which are expected to absorb a considerable part of the stocks now held by the Commodity Credit Corporation. The failure of exports affects mostly certain varieties of tobacco, such as fire-cured and dark air-cured and, to a lesser extent, Maryland. The domestic varieties—flue-cured, Burley, Maryland and cigar tobaccoes—present a more favourable picture, as home consumption has of late been steadily increasing, along with the industrial expansion due to the defence programme.

Accordingly, already for 1941, the acreage allotments of the export varieties of tobacco have been reduced, compared with 1940, while those of flue-cured and Burley, mainly used for domestic consumption, were increased slightly. For 1942, the acreage goals are slightly increased for flue-cured tobacco, while those for Burley and other domestic tobaccoes are slightly diminished, taking into consideration the results of current production and the available stocks of the different leaves.

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COMPULSORY CROP INSURANCE

A SYSTEMATIC STUDY

by

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SUMMARY: Part I: Special characteristics of compulsory insurance: I. *General conditions.* II. *Special conditions essential for compulsory insurance.* III. *The practical application.* IV. *Limits.* V. *Advantages and disadvantages.* — Part II: The practice of compulsory crop insurance: *Preliminary remarks.* I. *Switzerland.* II. *Serbia.* III. *Yugoslavia.* IV. *Bulgaria.* V. *Poland.* VI. *U. S. S. R.* VII. *Japan.* VIII. *Canada.* IX. *North Dakota.* X. *South Dakota.* XI. *Argentina.* — Part III: Conclusions concerning liability to insure in compulsory crop insurance: I. *General considerations.* II. *Constituents of compulsory crop insurance.* III. *General interest in crop insurance.* IV. *The carrying-out of compulsory crop insurance schemes.* V. *Summary.*

PART I.

Special characteristics of compulsory insurance.

Compulsory insurance consists in the obligation of a citizen to effect a given insurance instead of being free to contract said insurance or not, at will. The liability of the person effecting the insurance implies, on the other hand, a corresponding liability on the part of the underwriter to accept all risks or, in other words, compulsory acceptance.

Compulsory insurance is always imposed by some authority ruling over the individual and often by the State itself, which, by means of a law or decree, prescribes liability to insure; sometimes the necessary dispositions are issued by a province, a canton, or, in some cases, even by a commune.

I. General conditions for compulsory insurance.

The putting into effect and the definition of the limits of compulsory insurance are dependent on the existence of certain conditions: it must correspond to the public interest, the incidence of the risk covered must be general and its nature must preclude its being covered by voluntary insurance.

(A) *Public interest in the insurance.*

The interest taken by the State in the putting into effect of an insurance may be inspired either by social or by economic considerations.

(1) Out of considerations of social nature, the State seeks to insure the existence of the economically weak and of those who are unable to help themselves from their own resources or to provide for their future.

In this way the State has an interest in preventing the worker from becoming impoverished as the result of accident, invalidity or unemployment; it also has an interest in seeing that the man who has suffered damage from fire or the misfortunes of war can rebuild his home. Considerations of social nature also sometimes play their part in farm insurance, especially in countries where production comes chiefly from small and very small holdings as, for instance, in Japan [1], where the peasant has no economic reserves and where, as a result, the bad harvest of a single year may ruin him completely.

Considerations of social policy have also led to the creation of compulsory third party indemnity insurance for motor car owners. When the state compels the owner to effect this form of insurance, it is for the purpose of protecting the injured from the insolvency of the driver and, consequently, to guarantee their claims for compensation.

(2) The economic interest is determined by the type of production in a given country.

Economic interests of the State in agriculture mainly concern its production. This is especially true in the case of countries where the product of agriculture is used not for home consumption alone, but also for export. The economic interest of the State increases in time of war, when agriculture is called upon to expand its production in order to ensure the people's food supply.

Compulsory insurance is one of the various measures adopted by the State in pursuit of its social and economic policy. It is not, therefore, an end in itself, but only a means intended to achieve certain objects aimed at by the State. This is true not only in those countries where agriculture is organized on socialist lines, as for instance in the U.S.S.R., but also in those where the agricultural organization is based on free private initiative.

(B) *General incidence of the risk.*

Liability to effect an insurance can exist only where and in so far as the risk insured against actually exists. No one can be forced to insure against a risk which does not threaten him, nor yet against one which may exist theoretically but which has no practical importance, as, for instance, the fall of meteors.

Liability exists, therefore, for instance, in the case of insurance against accidents in the course of work, invalidity and old age, and against unemployment. It exists again in third party indemnity insurance for the motor car owners and

(1) In Japan about 70 per cent. of all peasant farms are under one hectare.

in fire insurance. In many countries hail also represents a fairly widespread risk and consequently offers the essential condition for compulsory insurance.

On the other hand, there could be no question of liability to insure in the case of an isolated insurance against avalanches or landslips because, even in mountainous countries, all the inhabitants are not threatened to the same extent with either of these disasters.

Where the incidence of given risks is not general several risks may be grouped together so as to form an artificial entity. If the combined risks are of such a nature that each insured party runs at least one risk, and perhaps even several at the same time, then the essential condition for compulsory insurance exists. An instance of this type of artificial entity composed of several different risks is to be found in insurance against loss due to natural causes in Switzerland, where a single insurance covers loss due to many natural causes, such as fire, flood, landslips, falling stones, avalanches and in part also hail and earthquakes. An even more complete combination of risks is to be found in the general crop insurance covering crops against risks due to natural causes, damage due to weather conditions, plant diseases and pests, as is the case with the Russian insurance against bad harvests and the American wheat insurance.

(C) *The shortcomings of voluntary insurance.*

Even when conditions A and B are fulfilled it is still impossible to constitute a compulsory insurance if and when public demand for the insurance is adequately met by the existing insurance organization, in the form whether of private companies or State institutions.

Consequently, compulsory insurance must only be introduced in those cases in which either no insurance exists at all, or in which, although existing, it does not answer the demands made on it in the public interest.

(1) The following are the chief forms of insurance which have so far been avoided by private companies, although they are of public interest:

(*a*) social insurance whose great importance is often misunderstood by those whom it concerns, or which cannot be organized rationally, even when understood, because the individual's capacity for payment is often inadequate;

(*b*) general crop insurance, which offers such great risks that a private underwriter does not possess sufficient working capital to carry it, while it often involves so high a rate of premiums that farmers, who, besides, are usually in reduced circumstances, are unable to pay them out of their own pockets.

(2) The chief branches covered by private insurance agencies to-day, without, however, fully meeting the demands dictated by public interest are as follows:

(*a*) hail insurance, in which the insurance of those who are most severely threatened by this risk is often made impossible by the prohibitive premium rates required by private underwriters or by their outright refusal to accept the insurance;

(*b*) fire insurance, in which underwriters do not canvass owners of small properties, especially if said properties are situated in regions difficult of access,

as, for instance, in outlying mountainous districts, so that the owners are deprived of the protection offered by insurance;

(*c*) third party indemnity insurance for motor car owners in which private underwriters often do not have much interest because the business is apt to take an unsatisfactory turn.

The statements made under 1 and 2 have only a relative value. They only hold good for present insurance conditions in the most advanced countries. Both the moment to which one refers and the specific conditions of the different countries give rise to fundamental differences.

At the beginning of the last century fire insurance on buildings, for instance, had not yet become very widespread, with the result that several countries created government institutions for fire insurance and made this form of insurance compulsory (*e. g.*, Germany, Switzerland and Poland). With the gradual development of private fire insurance, compulsory insurance, which had originally been necessary, often lost its importance. On the other hand, there are still to-day some countries, such as Bulgaria, where private insurance companies refuse to handle hail insurance.

General crop insurance, which at the present might seem too heavy a burden for a private organization, will perhaps be undertaken in the future even by private underwriters as the technique of insurance gradually improves and especially when the reinsurance market expands.

Compulsory insurance against war risks constitutes a matter of public interest only for the duration of the war or of the conditions deriving therefrom.

II. Special conditions essential for compulsory insurance.

Even when the general preliminary conditions for the introduction of compulsory insurance as described in Chapter I actually exist, this type of insurance is still far from certain realization. The introduction of every compulsory insurance still depends on a whole series of special considerations, historical, political, as well as psychological and economic, which differ from one country to another. In connection with the two last-mentioned considerations, the following brief remarks may be added:

The mental attitude of a nation towards compulsory insurance. If the majority of a nation is hostile to compulsory insurance, it is scarcely probable that such insurance will be introduced. This is why the Federal Crop Insurance Corporation in the United States refrained from making insurance compulsory. In Switzerland also farmers will have nothing to do with compulsory hail insurance applied to all the cantons, although some of the cantons have introduced it within their own boundaries.

The financing of compulsory insurance. While some forms of compulsory insurance, such as, for instance, compulsory third party indemnity insurance in the case of motor car owners, are not a burden on government funds, there are other types of compulsory insurance which call for large government appropriations. This is particularly the case for social insurance and general crop insurance, both of which can scarcely be put into effect without financial aid from the State.

When the State does not have adequate resources for covering insurances of this kind, it must abandon the idea of compulsory insurance, however important its introduction may appear.

III. The practical application of compulsory insurance.

Compulsion in insurance acts in two directions. In the first place it acts upon the citizen by imposing upon him the liability to insure and, in the second place, on the underwriter who is obliged to cover all the risks comprised in the compulsory insurance (compulsory acceptance). Without compulsion to accept it is impossible to put compulsory insurance into effect with success.

But compulsory acceptance is still not sufficient, because the underwriter may render it illusory by means, for instance, of an exceptionally severe limitation of insured capital, by fixing prohibitive premium rates or by setting special limits to the extent of compensation.

The State which enforces compulsory insurance must not therefore confine itself to providing for compulsory acceptance, but must also see that the insurer grants fair terms when covering the property insured under compulsory insurance, without laying a heavier burden on any of the insured parties than is called for by the actual risk against which they are insuring.

The putting into effect of compulsory insurance will take different forms according to whether an underwriter already exists who is willing to accept the conditions described above, or whether he still remains to be found.

(*A*) Private or public underwriters exist. On this supposition two cases may be distinguished:

(1) Existing underwriters accept compulsory insurance without any special Government compensation. This form of compulsory insurance is found sometimes for risks which do not make any extraordinary demands on the insurers, as, for instance, fire insurance. In this case the underwriters are often even grateful to the Government which brings them all the business automatically, enabling them thus to avoid heavy outlay for canvassing and increasing their turnover. Compulsory insurance of this description is found in Switzerland in the cantons of Argovia and Basel-Country for fire insurance and insurance against damage to movable property from natural causes.

(2) The existing underwriters are not willing to undertake compulsory insurance as matters stand, but allow themselves to be persuaded by the granting of concessions of financial kind or in respect of organization. Financial concessions may consist of Government grants, subsidies on premiums, State guarantees, State reinsurance, etc. As a concession in respect of organization we can mention that of insurance monopoly.

In Bulgaria the Government was obliged to place considerable sums at the disposal of the State Institute for Hail Insurance in order to enable it to undertake compulsory insurance. The Government not only pays large subsidies on the insurance premiums for compulsory hail insurance in the Swiss canton of Basel-Town, but has also reserved the legal monopoly to the Swiss Company for hail insurance which handles compulsory hail insurance.

(*B*) The matter of compulsory insurance cannot be entrusted to private or government underwriters, either because they do not exist or else because existing underwriters refuse to handle the business.

In such cases the State must create a special insurance institution, either in the form of a special branch of the general administration of the State, or else in the form of an independent insurance institution.

A compulsory Government institution may function in two ways:

(1) It may compete with any existing private underwriters. This type of competition exists, for instance, for hail insurance in Dakota and in some of the Canadian provinces.

(2) It may have an insurance monopoly excluding any possible private competition. In practice there are the following two grades of State monopoly:

(*a*) The exclusion of competition exists only in so far as it is affected by compulsory cover, while for the remainder private underwriters may engage in business. This organization is found in the Swiss Accident Insurance Company at Lucerne.

(*b*) Private competition is completely excluded; this is the case in the U. S. S. R. with the State insurance (*Gosstrach*), and also in the Canton of Vaud for government hail insurance. The cantonal fire insurance companies in Switzerland have also usually arranged for a guarantee of absolute monopoly.

(*C*) A special type of compulsory insurance is represented by what is termed "optional application of compulsory insurance" according to which citizens with a right to vote in a commune or district decide whether and to what extent compulsory insurance may be introduced.

This form of compulsory hail insurance esists in some of the Canadian provinces. Optional application of compulsory insurance is found in Switzerland for livestock insurance. It has been suggested for hail insurance in several cantons, for instance, in Tessin in 1899, and in 1928 in the canton of Berne, but up to the present it has not been put into practice in any canton.

IV. Limits of compulsory insurance.

Public interest not only decides whether or not it is necessary to decree liability to insure (see Chapter I A), but also determines the limits of compulsory insurance.

Compulsory insurance has both a lowest and a highest limit. Both are defined by the object aimed at compulsory insurance. This object must be attained; this is the lowest limit. On the other hand, however, the liability must be pushed farther than is required by public interest. This is the highest limit.

These limits to compulsory insurance are fixed in social insurance by the income of the insured person, in agricultural insurance by certain minimum incomes determined according to type of crop and to unit of area. In building insurance the value of the buildings is used as a basis.

(A) The lowest limit for compulsory insurance. If compulsory insurance is to achieve the objects aimed at in the public interest, compensation claims must not be reduced to too low a figure. Consequently, in compulsory workers' com-

pensation insurance or workers' invalidity, it is unpractical to fix the rate of compensation at such a low figure that when an accident occurs, the insured person does not receive the minimum required for his maintenance. In the same way, compulsory crop insurance which, when the harvest is bad, does not enable the peasant to continue farming, would not attain its purpose. In compulsory third party indemnity insurance for motor car owners the values corresponding to the claims which may under normal circumstances derive from the responsibility in question must also be covered.

(B) Highest limit to compulsory insurance. Liability to insure should not, however, go beyond the limits set by the public interest involved in the insurance.

It is therefore with good reason that, in the case of workers and persons with a small income, a limit has been set to the liability to insure against accident, invalidity, old age and unemployment, while persons with a larger income are free to effect an insurance or not.

There is equal justification for the fact that in the case of crop insurance compulsion applies only to expenses for cultivating the land and for production, while it could not be applied to cover profits deriving from production, this being left to the free choice of those concerned.

Even in the case of compulsory third party indemnity insurance for motor car owners, since the sums insured must perforce be covered, they must be limited to the amounts normally claimed as compensation for losses incurred (approximately between 50,000 and 100,000 units of value). Public interest in compulsory insurance does not therefore go far enough to guarantee the satisfaction of exceptionally high compensation claims.

Only in insurance against damage to buildings, which aims at offering the owner the possibility of rebuilding his house in case of accident, it is usual to extend the liabiliy to the total value of the building unless special conditions call for lower cover (1).

The establishment of an upper limit to compulsory insurance is especially important where the government is compelled to give financial support to a scheme of insurance, as is generally the case in social insurance and crop insurance.

V. Advantages and disadvantages of compulsory insurance.

When a compulsory insurance is not in the public interest and does not therefore appear necessary from the standpoint of social or economic policy, it should not be introduced. Besides some obvious advantages, all compulsory insurance has its disadvantages, whether inherent to the system itself or to the application of a given form of insurance. Nevertheless, in the case of a compulsory insurance having valid reasons for its existence, the advantages outweigh the disadvantages.

(1) In Japan the Government brought forward a bill in 1933 for compulsory insurance against earthquakes, according to which, owing to the gravity of the risk, only insurable values up to 3,000 yens were to be covered. ISHII: Japan, in *La Réassurance*, No. 193, January, 1934, p. 55.

(A) *Advantages of compulsory insurance.*

(1) The economic existence of the insured party is guaranteed to the extent of the compulsory insurance. This holds good not only for the various branches of social insurance, but also for crop and building insurance, as well as for third party indemnity insurance.

(2) Compulsory insurance which includes all risks, even the slightest, permits of very far-reaching compensation between serious and slight risks. A one-sided accumulation of heavy risks, from which some branches of insurance, as, for instance, hail insurance and insurance against damage by flood, have to suffer, is accordingly eliminated under the compulsory system.

(3) The compulsion exercised by the Government concerning insurance effects a considerable reduction in the underwriters' cost for canvassing and management. The problem of knowing whether an insurance should or should not be contracted does not present itself. If there is competition among several underwriters, it is no longer a question of deciding upon a choice of insurers (as in the case, for instance, of third party indemnity insurance for motor car owners). The underwriter holding the monopoly of an insurance receives his insurances automatically. An underwriter enjoying the monopoly of a State insurance may often even dispense with the issue of a policy, as is the case in compulsory insurance for vines and cereals in the canton of Vaud.

(4) The pooling of all risks, from the most serious down to the slightest, in a single combination of risks, as well as the reduction of administrative and the elimination of canvassing costs, make compulsory insurance less expensive.

This reduction of costs is clearly demonstrated in the premiums which, as a rule, are considerably lower than the premium rates for optional insurance.

(B) *Disadvantages of compulsory insurance.*

Besides the considerable advantages offered by compulsory insurance, it is inevitable that there should be some disadvantages. These stand out the more clearly, the more compulsory insurance is strict and comprehensive. The following are the chief disadvantages:

(1) Compulsory insurance interferes with the free will of the economic subject which it replaces by official compulsion. This is all the more painfully felt when compulsion is exercised on persons who have no need to insure themselves.

(2) Compulsory insurance, especially when exercised by underwriters enjoying a monopoly and therefore exempted from the need to take account of competition, leads to the adoption of a schematic basis for judging risks, which may result in injustice. As a general rule the classes of risks constituted are very few and consequently there is little differentiation in the premiums.

Sometimes only a single rate of premium is fixed which must be paid uniformly for every risk, whether serious or slight.

(3) Compulsory insurance calls for considerable State subsidies in some of its branches, such as, for instance, social insurance and general crop insurance. In the last analysis these subsidies must come out of the general taxpayer's

pocket. In this way, a given category of the population is benefited at the expense of the whole community. This is also one of the disadvantages of compulsory insurance which must not be underestimated and which shows, moreover, that compulsory insurance must be strictly confined within the limits indicated by public interest.

In compulsory insurance, apart from the usual subsidies, unrecoverable grants have occasionally to be made by the government or by the commune, and this may be an exceedingly heavy burden, especially in the case of compulsory crop insurance during periods of depression.

PART II.

The practice of compulsory crop insurance (1)

Preliminary remarks.

Crop insurance has for its object to cover damage to crops due to natural causes. This damage may be due to the following risks: the elements (*e. g.*, hail, flood, landslips, storms, avalanches, snow); abnormal weather conditions (*e. g.*, drought, aridity, moisture, frost, winter cold); plant pests and diseases.

There are several widely different forms in which crop insurance can be effected.

Crop insurance may be contracted either against given risks from the elements, such as hail and frost. In these cases it is given the name of the risks to which it applies. It may also cover at one and the same time several different risks of damage due to the elements, as for instance, some of the elementary forces (hail and thunderstorm), or elementary forces and harmful weather condi-

(1) General literature dealing with the subject: ROHRBECK: Die Organisation der Hagelversicherung. Berlin, 1909 (quoted as ROHRBECK: Organisation). — MANES: Versicherungs-Staatsbetrieb im Ausland. Berlin, 1919 (quoted as MANES: Staatsbetrieb). — VALGREN, V. N.: Hail Insurance on Farm Crops in the United States. U. S. Department of Agriculture, Bulletin No. 912. Washington, 1920. English summary in *International Review of Agriculture*, Nos. 5, 6-7 for May, June-Juli, 1921, pp. 264-273 E, 334-340 E. — LENGYEL: Das öffentlich rechtliche Versicherungswesen in den ausserdeutschen Staaten, in *Wirtschaft und Recht der Versicherung*, supplement to the review *Versicherung und Geldwirtschaft*. Berlin, 1925, pp. 1-55. — MANES-ROHRBECK: Hail Insurance: Its Economic Aspects, in *International Review of Agriculture*, No. 3, July-September, 1926, pp. 331-380 E. — MANES: Versicherungswesen. 5th edition, Vol. I, 1930, § 9, pp. 118-124; Vol. II, 1931, §§ 9 and 10, pp. 129-147 (quoted as MANES: Versicherungswesen). — WEISS: Probleme der Hagelversicherung, in *Assekuranz-Jahrbuch*, Vol. 51, 1932, pp. 96-168. — ROHRBECK: Die Hagelversicherung in der Welt. Berlin, 1937 (quoted as: ROHRBECK: Welthagelversicherung). — AMMON: Zwangsversicherung gegen Hagelschaden, in *Versicherungs-Archiv*, No. 3-4, September-October, 1939, pp. 85-90. — ROHRBECK: Wirtschaftswissenschaftliche Forschungsaufgaben des Versicherungswesens. Veröffentlichungen des Berliner Hochschulinstituts für Versicherungswissenschaft, BOOK 2, Berlin 1939, pp. 33-50 (quoted as ROHRBECK: Forschungsaufgaben). — ARCOLEO: Crop insurance, in *International Review of Agriculture*, Nos. 7-8, 9 for July-August, September 1940, pp. 271-276 E, pp. 306-316 E. — SCHLUMBERGER: Zur Frage der Ernteversicherung, in *Zeitschrift für die gesamte Versicherungswissenschaft*, Vol. 42, Book 1, February 1, 1942, pp. 12-26. — ROMMEL: Aufbau und Durchführung der Ernteversicherung in den Vereinigten Staaten von Amerika, in *Schriftenreihe des Instituts für Versicherungswissenschaft der Universität Köln*, Book 5, pp. 28-51.

tions (hail and frost); in this case it is termed " combined crop insurance ". The two types of insurance represent an insurance against damage to crops. In the case of crop insurance against a combination of all risk of damage from natural causes, in other words, against damage caused by the elements and damage due to weather conditions, as well as plant pests and diseases, it may be called " general crop insurance " or simply " crop insurance ".

Crop insurance covers either a few particular crops, namely, those of greatest importance in the production of a given country, such as wheat or cotton in the United States of America, rice, mulberry leaves and cereals in Japan,or else various types of crops simultaneously, as often happens in the case of hail insurance.

There may be a great variety of combinations of the risks and the crops insured, but as a general rule the following principle prevails:

The greater the number of risks insured against, the smaller the number of crops to which the insurance applies. General crop insurance in the United States only covers wheat and its extension to other crops is at present only envisaged as a possibility.

The fewer the risks covered, the greater the number of crops which can be insured. A typical example of this is hail insurance.

Crop insurance is subject to restrictions as regards both risks and the goods insured. A crop insurance covering every kind of crop in a country against all the elements is still only in its infancy. The complications involved in the putting into effect of a scheme of insurance of this description, as well as its risks, are considerable.

* * *

General crop insurance and combined crop insurance are not yet very common. With the exception of a few countries, particularly advanced in this respect, especially the United States, the U. S. S. R. and Japan, crop insurance is limited at the present time to damage by hail.

If crop insurance is still uncommon, the same may be said with even greater truth in connection with compulsory crop insurance, since all crop insurance policies are not taken out under compulsion. Thus, the very interesting wheat insurance scheme in operation in the United States, for instance, is voluntary.

The notes which follow apply to the most important forms of compulsory crop insurance. It has unfortunately been impossible to obtain information concerning every type of insurance, and certain interesting data are lacking even in the case of the types described below.

Whenever possible the legal texts concerning the subject have been used. Where this has been impossible, as, for instance, for Yugoslavia and Canada, recourse has been had to the specialized press. Unfortunately some contradictions have been found and, although the greatest care has been taken, it has not always been possible to eliminate them. If errors have occurred in some cases, the writer offers his apologies and will be most grateful to anyone for suggesting corrections.

The information given below has been arranged according to countries, beginning with Europe. Mention has also been made of compulsory insurance schemes which have subsequently been discontinued. Even schemes of compulsory insurance which have proved unsatisfactory are of importance in the present study, since they illustrate the mistakes made and consequently help to avoid their repetition.

I. Switzerland.

(A) *Compulsory Government hail insurance in the canton of Vaud* (1).

(1) *Organization.* — Cantonal hail insurance is based on the law dated October 25, 1928, and on the supplementary law of February 4, 1941, as well as on the regulations of March 28, 1930, in the edition of February 11, 1941. This insurance scheme came into force on January 1, 1929.

Hail insurance is handled by a special government institution which holds the monopoly. Liability to insure applies to all farmers appearing on the Land Register as owners of vineyards or land sown to cereals.

(2) *Risk.* — The insurance applies to damage from hail. Loss caused by other natural visitations, such as torrential rains, floods, storms or frost (2), plant pests and diseases are not covered.

(3) *Purpose.* — Compulsory insurance is extended only to the most important crops in the canton: vines and cereals. Other crops are insured by the Institute on request.

(4) *Amount insured.* — Compulsory insurance only includes production costs which are fixed officially per hectare and amount to 40 francs for vine-insurance, 8 francs for bread-making cereals and 6 francs for other cereals. Larger amounts may be insured optionally. The amounts insurable for other crops, such as pastures, fodder plants, vegetables, root crops, fruit, berries, etc., can be fixed voluntarily by the insured person up to the actual value of the crop.

(5) *Premiums.* — Premium rates for the various crops are fixed each year.

At the present time the premium rates are 5.5 per cent. for vine, 1.4 per cent. for cereals, from 1 to 4 per cent. for other crops and 8 per cent. for tobacco. The amount of the premiums does not vary from one district to another. Since the area of the canton is extremely small it has been considered possible to dispense with the differentiation of premium rates according to district. The

(1) Bibliography: Exposé des motifs et projet de loi créant une assurance cantonale vaudoise contre les dégâts de la grêle (October 1928). — Annual reports of the Institute 1929-1940. — BLANC, H.: L'assurance obligatoire contre la grêle, in *La terre vaudoise*, No. 44, October 29, 1927, pp. 716-719. — PORCHET, F.: L'assurance obligatoire cantonale contre les risques de grêle, in *La terre vaudoise*, No. 48, November 26, 1927, pp. 771-774. — FAEH, E.: Die Hagelversicherung in der Schweiz, in *Zeitschrift für schweizerische Statistik und Volkswirtschaft*, Year 71, No. 4, 1935, pp. 517-533. — LANZ und ROMMEL: Elementarschäden und Versicherung, Bern, 1936, Vol. II, pp. 1013-1018.

(2) After the severe late frost in April, 1938, the introduction of compulsory cantonal frost insurance was contemplated. So far nothing concrete has been done.

canton pays subsidies on the compulsory insurance premiums for vines and cereals and on those for optional insurance of other crops. These subsidies amount at the present time to 33 per cent. for compulsory insurance of vines, to 20 per cent. for compulsory insurance of cereals and to 10 per cent. for other crops. Part of these subsidies is refunded to the canton by the Confederation under the decree issued by the Federal Council on February 25, 1938.

(6) *Compensation.* — Loss is calculated in per cent. of yield on the basis of the amount insured and, in the case of overinsurance, on the basis of the real value of the crop.

Compensation claims are restricted in two senses. Small losses under 8 per cent. are not subject to compensation. The insured person must bear the burden of 6 per cent. of all loss entitled to compensation. In exceptional cases the law provides for a reduction of compensation for particularly heavy losses.

(7) *Reserves and reinsurance.* — From the financial point of view, the Institute is established on a solid basis. It possesses a reserve fund to which the Government contributed 500.000 francs a year in 1929 and 1930. This fund now totals approximately 1,500,000 francs. The Government has also given a guarantee up to 5,000,000 francs to ensure the Institute's capacity to meet its liabilities.

Reinsurance was introduced in 1932; it was contracted with Lloyd's, London. At first, only a surplus was reinsured, but now there is a combined reinsurance by quota cession and surplus [1].

(8) *Activity.* — During the twelve years in which the Institute has paid compensation, there were four years when the amount paid exceeded the annual income. Nevertheless, the Institute's gross turnover during these twelve years shows a small credit balance of 5.25 per cent.

Results of the administration of Government hail insurance in the canton of Vaud from 1929 to 1940.

Branch	Amounts insured	Premiums and Subsidies	Average premium rate	Compensation payments including assessments and commission	Rate of compensation paid in % of premiums	Profit or loss
	Fr.	Fr.	%	Fr.	%	Fr.
Compulsory insurance:						
Vines	166,260,925	9,140,894	5.50	9,041,462	98.91	+ 99,432
Cereals	223,318,836	2,640,883	1.18	2,133,110	80.77	+ 507,773
Optional insurance:						
Vines	36,110,294	2,019,825	5.59	1,954,120	96.75	+ 65,705
Cereals	61,777,341	788,347	1.28	708,220	89.84	+ 80,127
Insurance of other crops	13,687,560	385,696	2.82	352,677	91.44	+ 33,019
Total	501,154,956	14,975,645	2.99	14,189,589	94.75	+ 786,056

[1] These details concerning reinsurance may be found in the Institute's annual report for the year 1938, p. 6.

Compulsory insurances constitute the greater part of the business, amounting to approximately 75 per cent. of the total amount insured.

Compensation payments under compulsory insurance amounted to 94.85 per cent. of premiums and subsidies, which shows that premium rates are extremely low. They are considerably lower than those charged by the Swiss Hail Insurance Company which did business in the canton until 1928.

The movement of compulsory and optional transactions will be seen from the table on page 178 showing gross transactions during twelve years.

(9) *Summary.* — The hail insurance scheme in the canton of Vaud has proved successfull.

The amounts insured have almost doubled since the introduction of compulsory insurance, although this form of insurance covers only the two principal crops grown in the canton, and the values to be insured compulsorily are assessed at a very low figure.

The premium rates have been considerably reduced since compulsory insurance was introduced; they have also been stabilized.

As a result of government contributions to the reserve fund, the government guarantee and reinsurance, the Institute has attained so strong a financial position that it will undoubtedly be able to cover even catastrophic losses.

The organization of hail insurance in the canton of Vaud proves that compulsory hail insurance can be established even on a very small territory. Although it was found necessary to interrupt compulsory vine insurance in 1938 owing to the catastrophic losses caused to the vineyards by frost, this need not be considered as a shortcoming inherent to the system.

(B) *Compulsory hail insurance in the canton of Basel-Town* (1)

(1) *Organization.* — Compulsory hail insurance is based on the law of April 23, 1931, which came into force on June 9, 1931.

This insurance is handled by the Swiss Hail Insurance Company with headquarters in Zurich. Compulsion to insure is extended to all farmers cultivating more than 3 ares of land.

(2) *Risk.* — Insurance covers only damage by hail.

(3) *Purpose.* — The following crops are subject to compulsory insurance: cereals, potatoes, berries, and vegetables. For other crops insurance is optional.

(4) *Amounts insured.* — In order to make the protection offered by compulsory insurance fully effective, the State Council fixes each year the minimum values per are for the insurance of crops subject to it. These minimum values are very high, representing approximately from 85 to 90 per cent. of the maximum insurable values established by the Swiss Hail Insurance Company. This

(1) Bibliography: Ratschlag und Gesetzesentwurf betreffend obligatorische Hagelversicherung, March 26, 1931, official printed document No. 3122. — FAEH: Die Hagelversicherung in der Schweiz, in *Zeitschrift für schweizerische Statistik und Volkswirtschaft*, Year 71, No. 4, 1935, pp. 517-533. — Supplementary communications by the Department of the Interior.

will be seen from the amounts fixed by the cantonal government for the year 1941, to which the maximum values of the Swiss Hail Insurance Company have been added in brackets:

Autumn wheat	Fr.	14.50	(16.—)	per	are
Autumn rye	»	12.—	(14.—)	»	»
Autumn barley	»	10.—	(12.—)	»	»
Oats	»	10.—	(12.—)	»	»
Spring wheat	»	13.—	(14.—)	»	»
Spring rye	»	11.—	(12.—)	»	»
Spring barley	»	9.—	(10.—)	»	»
Potatoes	»	23.—	(28.—)	»	»

Insurance for larger amounts is optional and may reach the maxima fixed by the Swiss Hail Insurance Company; crops not subject to compulsory insurance may also be insured if desired. Owing to the large State subsidies enjoyed by optional insurance, this form of insurance is very popular with farmers.

(5) *Premiums.* — Premiums are fixed on the same principles as those practised by the Swiss Hail Insurance Company. The average premium rate is 3.2 per cent.

The canton pays subsidies amounting to 50 per cent. on all premiums, including optional insurance premiums. Part of these subsidies is refunded to the canton under the terms of the Federal Law on Agriculture, and at present, of the decree issued by the Federal Council on February 25, 1938. Beginning with the past year, the Confederation pays 7 ½ per cent. and the canton the remaining 42 ½ per cent.

(6) *Compensation.* — Compensation is subject to several restrictions in conformity with the general conditions established by the Swiss Hail Insurance Company.

(*a*) Compensation is not paid on losses representing less than 8 per cent. of the value subject to compensation as fixed by experts.

(*b*) In case of loss exceeding 8 per cent. of the value subject to compensation the first 4 per cent. of this value is borne by the insured person. When the damage reaches 50 per cent. or over, this uncovered quota is raised to 5 per cent.

(*c*) In case of exceptionally heavy loss, when the ordinary premiums, possible supplementary deposits and even additional sums drawn from the reserve fund are inadequate to cover the damage, compensation may be reduced in proportion.

(7) *Reserves and reinsurance.* — The Swiss Hail Insurance Company has an important reserve fund as well as a combined quota and surplus reinsurance.

(8) *Results.* — The experience obtained with hail insurance in the canton of Basel-Town has been satisfactory. Besides compulsory insurance, optional insurance has made excellent progress due to the large 50 per cent. subsidy paid by the Government on premiums. The values covered by optional insurance represent some 50 per cent. of those covered by compulsory insurance. This is all the more noteworthy in that the minimum amounts subject to compulsory insurance are very large.

The number of policies, which totalled about 100 in the last few years before the introduction of compulsory insurance, has reached 500 since its introduction. In 1930 the amounts insured totalled about 320,000 francs; in 1940, this figure had increased to 1.8 million francs.

The progress of business may be seen from the data given below, drawn from the reports issued by the Council of State.

Progress of hail insurance in the canton of Basel-Town.

Year	Number of policies	Amounts insured			Premiums	
		compulsory	optional	Total	Fr.	in percent. of insurance amount
1930	115	—	319,740	319,740	6,265 —	1.96
1933	514	1,061,200	439,440	1,500,640	49,573.20	3.30
1936	560	1,087,000	528,160	1,615,160	54,095.10	3.35
1939	536	1,159,630	571,000	1,730,630	52,152.60	3.01
1940	545	1,215,110	590,980	1,806,090	53,310.80	2.95

The activities of the year 1940 were already affected by the war, which caused the extension of the area sown to crops and an increase in prices. This is especially noticeable in the progress marked in 1941 when the amount insured rose to 2,007,290 francs.

With regard to damages the situation during the ten-year period 1931-1940 was extremely satisfactory. According to the reports issued by the Swiss Hail Insurance Company, only 62,188.70 francs were spent in compensation payments, representing only 0.40 per cent. of the ten-year insured values, which totalled 15,666,070 francs.

(C) *Compulsory cantonal insurance against damage from the elements to cultivated land and crops.*

State aid for persons who have suffered damage from natural causes in Switzerland dates from the XVIIIth century and was originally financed from cantonal relief funds. In the XXth century the money required has been drawn from the insurance funds.

Insurance against damage caused by the elements to cultivated land and crops in Switzerland is quite peculiar and, as far as can be ascertained, has no parallel in any other country. Its very special form is due to the geological and climatic peculiarities of a mountainous country. In a country of this description the forces of nature (torrential rains, overflowing streams, floods, landslips, falling stones, soil subsidence, avalanches, etc.), threaten not only the crops, which in these districts are as a rule of little value (*e. g.* grazing, pasturage), but even the cultivated soil itself or, in other words, the land capital which is often not only damaged but actually destroyed. As damage suffered by the soil is more serious than the loss of crops, the soil forms the primary object of

insurance, while crops and, in part, some of the works constructed for technical purposes (such as roads and paths, canalization of streams) as well, are considered in case of damage as forming part of the land. It is therefore not yet a question of an independent crop insurance. It is only in the most recent law, the one applying to Basel-Country, that crops form an independent object for insurance.

The following is a list of the cantons where insurance of cultivated land and crops actually exists, with the laws now in force in connection therewith:

Canton of Nidwalde: Insurance since 1920. The law now in force dates from April 26, 1936, and concerns assistance in case of non-insurable loss due to the elements; it is amplified by the law of April 26, 1942.

Canton of Appenzell outer Rhodes: Insurance since 1923. The law now in force concerning insurance against damage caused by the elements dates from April 27, 1930.

Canton of Grisons: Insurance since 1925 under the terms of the law dated January 18, 1925 concerning compensation for loss caused by the elements, with amendment dated March 6, 1932.

Canton of Basel-Country: Insurance since 1941 under the terms of the law of March 27, 1939 concerning insurance against loss caused by fire and the elements to buildings and movable property, concerning the fire brigade and the extinction of fires, as well as concerning insurance against damage suffered by cultivated land and crops.

The regulations governing insurance of cultivated land and crops against damage by the elements are fairly uniform in the various cantons. Consequently there is no need to describe all these laws; only the regulations in force in the canton of Basel-Country will be described here, as they may be regarded as the most highly developed.

(1) *Organization.* — Insurance of cultivated land and crops forms Part IV of the cantonal law concerning insurance and is dealt with in 14 articles. Insurance is handled by a Government institution. All owners of landed property except the State and the communes are compelled to contract an insurance. The institution enjoys a monopoly for all insurance where there is liability to insure.

(2) *Risk.* — This is a combined insurance against damage from the elements. The risks insured are: serious swelling of rivers, floods, landslides of earth and rocks, soil subsidence, storms, and the breaking of trunks and tops by the weight of ice and snow. This is a complete list of risks covered.

There is no cover for loss due to plant pests and diseases nor for damage by hail which is handled by a private insurance company.

(3) *Purpose.* — The insurance covers cultivated land and the plants which grow on it, or, in other words, meadows, vineyards and pasturage, as well as gardens, forests, fruit and ornamental trees and crops [1].

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[1] In the canton of Appenzell outer Rhodes, only fruit trees, vines and market crops are insured as forming part of the land. In the canton of Nidwalde grazing land and market crops are considered as forming part of the land and are insured as such, together with fruit and forest trees.

Over and above the cultivated land, certain works erected for technical purposes are also included in the insurance, such as private roads, paths, bridges, dams, etc.

(4) *Amount insured.* — The amount insured corresponds to the land register assessment of land under gardens, arable and forests.

(5) *Finance.*

(*a*) The capital for establishing the insurance institution was obtained from two funds destined for persons who had suffered damage from flood; the capital amounted to 300,000 francs (1).

(*b*) *Premiums.* — The uniform premium charged for the insurance of cultivated land and crops is 0.10 per thousands of the land register assessment (2). The law contemplates special premiums for insurance of works constructed for technical purposes.

(*c*) *Government subsidies.* — In order to compensate for low premiums it was necessary to grant the insurance institution large government subsidies. These amount to 100 per cent. of the premiums paid by the owners of landed property. The canton pays 75 per cent. and the communes 25 per cent. Over and above the cantonal and communal subsidies, further subsidies from the Confederation are contemplated.

(6) *Compensation.* — Owing to the fact that the premiums and government subsidies cannot fully cover losses, it has been necessary to restrict compensation. All loss entitled to compensation is subject to an initial deduction of 50 francs. The remaining loss is compensated up to 50 per cent (3).

The law does not contemplate any reduction of compensation justified by inadequacy of funds (4).

(7) *Reinsurance.* — Under the terms of the law, the Council of State is authorized to reinsure part of the risk. So far this reinsurance has not been effected, so that the Bank can count only on its own resources.

(8) *Execution.* — This insurance scheme came into operation on January 1, 1941. The decree of execution contemplated under the law has not yet been issued. No results are as yet available concerning the practical working of this law (5).

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(1) In the canton of Appenzell outer Rhodes, the institution has a reserve fund of about one million; in the canton of Nidwalde and Grisons the reserve funds total 300,000-400,000 francs.

(2) In the canton of Appenzell outer Rhodes and in the Grisons the uniform premium is also 0.10 per thousands; in the canton of Nidwalde it is 0.20 per thousands.

(3) In the canton of Appenzell outer Rhodes compensation also amounts to 50 per cent.; in Nidwalde to 40 per cent.; in the Grisons it fluctuates between 20 and 50 per cent. according to the financial circumstances of the person affected by the damage.

(4) In the canton of Nidwalde and the Grisons, on the other hand, the laws contain provisions to this effect.

(5) The movement of loss in the cantons of Nidwalde and Appenzell outer Rhodes was as follows:

Canton	Period	Amount insured	Damage suffered by crops, cultivated land and works constructed for technical purposes	Rate of loss in ‰
Nidwalde	1930-1938	668,880,250	566,695	0,85
Appenzell	1931-1940	612,817.150	328,002	0,54

II. Serbia.

Compulsory State hail insurance (1).

Owing to the very serious risk of damage from hail in the former Kingdom of Serbia, hail insurance aroused general interest in that country as long ago as the end of last century.

In 1895, namely at the same time as in Bulgaria, a government institution for compulsory hail insurance was founded in Serbia. This insurance scheme, however, was a failure, owing to defective organization and to the insufficiency of the premiums.

In 1905 a supplement to the land tax was introduced for the purpose of paying compensation for damage caused by hail. Since this supplementary tax was not levied in accordance with the principles of insurance technique, but according to fiscal standards, it met with strong resistance and had to be abandoned.

III. Yugoslavia.

Compulsory hail insurance handled by banking institutions (2).

The attention of the Government in Yugoslavia was devoted to hail insurance at an early date.

(A) *Law dated July 31, 1923, concerning hail insurance subsidies* (3).

Under the terms of this law Government credits were granted for the encouragement of the insurance of sowings and field crops against damage by hail. To this law was due the

Compulsory State hail insurance in the Primorsko-Krajisko Comitat.

A compulsory State hail insurance scheme in this comitat was launched in 1928, the premium being a uniform one of 5 dinars per yoch of cultivated and uncultivated land (4).

If the standard premium was considered unfair, the fact that uncultivated land was included in the assessment for payment of this premium (61,000 out of

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(1) Bibliography: WEISS, p. 124. — ROHRBECK: Welthagelversicherung, p. 86.

(2) Bibliography: LENGYEL, pp. 20-22. — WEISS, pp. 124-125. — ARCOLEO: Hail Insurance in Yugoslavia, in *International Review of Agriculture*, No. 4, April 1935, pp. 161-167 E. — ROHRBECK: Welthagelversicherung, pp. 86-88, 206.

(3) Published in the official paper, No. 189, August 21, 1923. French translation in the *Annuaire international de législation agricole* 1923, pp. 721-729.

(4) Staatliche obligatorische Hagelversicherung in Jugoslavien, in *Die Versicherung*, Vienna, No. 30, July 23, 1931, pp. 495-496.

511,000 yochs were uncultivated), was considered as even less justified. Much discontent was aroused by delay in appraising damages and paying compensations, as well as by a 25 per cent. reduction on compensation paid in 1929 as a result of the heavy loss incurred (premiums- 2,663,186 dinars; loss- 3,536,000 dinars).

The insurance institution had to be closed in 1930 owing to a change in the constitution of the State involving a reorganization of the provinces.

(B) *The Royal Decree dated February 10, 1931, concerning hail insurance on wheat and field crops* [1].

Since State subsidies for hail insurance did not give the promised results, the above-mentioned enactment was promulgated in the form of a decree law. It contains the following provisions:

Compulsory hail insurance is put into effect in each banat separately in such a way that the Minister of Agriculture decrees compulsory insurance on the proposal of the banat administration and at the same time fixes a standard premium per unit of area of cultivated land. In handling compulsory insurance each ban issues an order of execution for the territory under his control, this order being also subject to approval by the Minister of Agriculture. The banat insurance is managed by an insurance committee which establishes the budget, fixes the premium rate and the compensation, approves assessments and payments and also submits annual reports.

Under the terms of this royal decree orders for the introduction of compulsory hail insurance were promulgated in the following banats:

Coastal Banat Primorska Banovina. Order dated January 4, 1932 (official paper No. 11, January 15, 1932).

Danubian Banat. Order dated January 18, 1932 (official paper No. 18, January 25, 1932).

Vrbatz Banat. Order dated February 19, 1932 (official paper No. 51, March 4, 1932).

Zeta Banat. Order dated January 28, 1933 (official paper No. 27, February 6, 1933.

Save Banat. Order dated March 6, 1933 (official paper No. 54, March 9, 1933).

Drina Banat. Order dated April 12, 1939 (official paper No. 86, April 18, 1939).

Vardar Banat. Order dated December 6, 1939 (official paper No. 287, December 14, 1939).

In spite of these orders, compulsory insurance, as far as it has been possible to ascertain, is actually in operation only in the Save and Danubian Banats.

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[1] This decree was published in the official paper, No. 43, February 25, 1931 and came into force on the same date. German translation in *Die Versicherung*, Vienna, No. 30, July 23, 1931, p. 496.

(1) *Compulsory hail insurance for wheat and field crops in the Save Banat.*

The above-mentioned order, dated March 6, 1933 (No. 8318/V, 1933) [1], was substituted on July 12, 1935, by a new order. This new order consists of ten articles containing the following provisions [2]:

(a) *Organization.* — The insurance scheme is managed by an independent mutual institution belonging to the Save Banat. The institution's field of activities covers the whole banat.

Insurance is compulsory for the most vitally important crops. Liability to insure is satisfied by effecting an insurance with the government institution. Anyone, however, who can prove that he has already contracted a hail insurance with a private company for the total area subject to insurance is exempt from the obligation to insure with the government institution. There is no government insurance monopoly.

Crops not subject to compulsory insurance may be insured with private companies. The banat insurance institution, moreover, also accepts voluntary insurance if the area sown to a single crop does not exceed 5 yochs.

(b) *Risk.* — The insurance applies exclusively to damage caused by hail.

(c) *Purpose.* — Compulsory hail insurance applies primarily to the principal crops grown in the country; cereals and vines, for instance, are subject to compulsory insurance, but other crops, such as hemp, flax, turnips, clover and alfalfa may be insured optionally.

(d) *Premiums.* — The premium rates are fixed by the ban on the proposal of the agricultural section of the banat administration; it is calculated on the basis of area of arable land or of vineyards, as may be the case. In the case of compulsory insurance, the premium must be paid in September, otherwise the payment is enforced by the communal administrations. Since the fiscal year runs from September 1 to August 31 of the following year, the premium is collected in advance.

In the case of voluntary insurance the premium must be paid simultaneously with the request for insurance.

(e) *Operation of the insurance.* — For the operation of the insurance the ban must issue special regulations which, unfortunately, we have been unable to procure. Certain details are therefore lacking concerning the insurance amounts, the calculation and rates of the premium, the assessment of damage, the calculation of compensation and the methods according to which payment is made.

Neither have we been able to obtain the annual reports issued by the banat insurance institution; consequently, it is not possible to give detailed information concerning the actual working of the institution.

All that can be concluded from the specialized press is that in 1937 premia to the amount of 35 million dinars were overdue, which would seem to show that

(1) This order is described by ARCOLEO, *op. cit.*, p. 166 E.

(2) Published in the official paper No. 191, August 19, 1935. German translation in *Assekuranz-Jahrbuch*, vol. 55 (1936), pp. 582-584.

compulsory insurance had encountered but little sympathy among the peasants. It is also stated that heavy damage amounting to 27 million dinars was caused by hail in the Save Banat in 1937 (1).

(2) *Compulsory hail insurance for wheat and field crops in the Danubian Banat.*

From the standpoint of hail insurance the Danubian banat is the most important in the country. In spite of this, the order referred to above, dated January 18, 1932, contemplating a standard premium of 5 dinars per yoch, has not been put into effect.

A new provincial order was issued on March 4, 1938, and published in the official paper dated March 16 (2). According to a communication in the specialized press, this order contained the following provisions:

Compulsory insurance with the government institution applied only to certain minimum yields established by the banat insurance institution for the various crops. Properties for which a private insurance had already been contracted in 1938 were exempt from the liability to insure with the institution, but this exemption only held good until the expiry of the contract and for a period not exceeding six years.

Crops which were not subject to compulsory insurance and values in excess of the sums compulsorily insured, could be insured voluntarily with private companies. This voluntary insurance was allowed without restriction for some cereals, such as wheat, oats, barley, maize, etc., while for other crops, such as turnips, potatoes, hemp, flax, tobacco, etc., it was limited to a cultivated area not exceeding 10 cadastral yochs.

As it has been impossible to obtain the text of the order, the regulations governing the operation of the insurance, or even the institution's annual reports, detailed information can unfortunately not be given concerning the compulsory hail insurance scheme in the Danubian banat and its working.

IV. **Bulgaria.**

Compulsory State hail insurance (3).

Hail insurance is of extreme importance in Bulgaria, where the agricultural population predominates and where the risk of damage due to hail is very great. This explains why the government undertook this insurance at a very early date,

(1) *Die Versicherung*, Vienna, No. 1, January 6, 1938, p. 15.

(2) *Die Versicherung*, Vienna, No. 1, January 6, 1938, p. 15; No. 12-13, March 31, 1938, p. 128.

(3) Bibliography: ROHRBECK: Organisation, pp. 238-240. — ROHRBECK: Welthagelversicherung, pp. 88-90, 206-208. — BOTCHEV: Protection against calamities due to natural causes in Bulgaria, in First International Conference for Protection against Calamities due to Natural Causes. Paris, 1937, pp. 458-464. — PEEF: Die Zwangshagelversicherung, in *Osiguritelno Delo* (General Insurance Review), Year I, No. 4, December, 1941, pp. 284-296. — Same author: Obligatorische Hagelsversicherung in Bulgarien, in *Neumanns Zeitschrift für Versicherungswesen*, No. 7, April 9, 1942, pp. 141-142. — Statements made to us personally by Dr. P. PEEF, Director of the Bulgarian office for the control of private insurance, to whom in particular our thanks are due for his collaboration.

seeing that the private insurance companies refused to handle hail insurance; it also explains why this form of insurance was outright made subject to compulsion.

(A) *Law dated January 13, 1896 concerning hail insurance.*

(1) *Organization.* — A special department in the Ministry of Trade and Agriculture was entrusted with the management of compulsory insurance. Liability to insure was extended to all crops. Since there were no private underwriters, the institution enjoyed virtual monopoly.

(2) *Risk.* — Only damage due to hail was insured against.

(3) *Purpose.* — All crops, with the exception of tobacco, are insured.

(4) *Insurance receipts:*

(a) Premiums. In every region and for all types of crop the premium represented a uniform 5 per cent. supplement on the land tax, equivalent to an average premium of 3 per cent. of the insurance amounts.

(b) An annual government subsidy of 500,000 levas.

(5) *Compensation.* — Compensation was paid only on loss exceeding 20 per cent. When cash receipts were inadequate compensation was reduced in proportion. The payment of compensations due did not begin until February of the following year.

(6) *Results obtained.* — As the premiums were very much too low, in no year was it possible for the insurer to pay compensation in full, as shown by the following table:

Year	Premiums levas	State subsidies levas	Total receipts levas	Ascertained losses levas	Compensation paid in levas	Compensation paid in % of loss
1896	895,465	500,000	1,395,465	2,442,375	1,367,888	56
1897	894,288	500 000	1,394,288	1,538,618	1,338,462	87
1898	898,115	500,000	1,398,115	8,591,347	1,288,428	15
1899	899,261	500,000	1,399,261	3,095,959	1,331,076	43
1900	989,098	500,000	1,489,098	5,310,320	1,380,343	26
1901	1,001,268	500,000	1,501,268	10,610,480	1,378,931	13
1902	992,819	500,000	1,492,819	6,482,206	1,361,004	21
1903	990,057	500,000	1,490,057	2,204,195	1,190,143	54
8 years	7,560,371	4,000,000	11,560,371	40,275,500	10,636,275	26

Compulsory State insurance was abolished at the end of 1903.

(B) *Law dated February 14, 1942 concerning hail insurance.*

After the abolition in 1903 of compulsory hail insurance there was no other means of insuring, since, as in the past, the private companies refused to handle hail insurance.

In 1910 the Goverment again undertook hail insurance. A law dated December 26, 1910, and published on January 13, 1911, introduced optional State hail insurance, to be handled by the Bulgarian Co-operative Agricultural Bank, which was amalgamated with the Bulgarian Agricultural and Co-operative Bank in 1934.

The extent to which this optional hail insurance was used left much to be desired until recently. Although 28 per cent. of the peasant farms had contracted insurance against damage caused by hail, the insurance amounts represented only a little more than 9 per cent. of the total crop value.

Since this result could in no way satisfy the public interest attaching to the insurance, compulsory insurance was introduced again.

The materials available on compulsory hail insurance, the results of discussions in commissions, the draft laws and the official memorandum have been extensively discussed recently by M. Peef in *Osiguritelno Delo*.

The new law was voted by the Sobranje on February 4, 1942, and published on February 14. It contains the following provisions:

(1) *Organization*. — The law deals with both compulsory and voluntary insurance. The latter is supplementary to compulsory insurance. Both types are handled by the Insurance Section of the Bulgarian Agricultural and Co-operative Bank. Since private companies still persist in refusing to handle hail insurance, the institution enjoys a virtual monopoly.

Under the terms of the law, compulsory insurance applies to the entire territory of the country and to all crops. The Council of Ministers is, however, authorized to restrict its application.

The law will be completed by an executive order regulating the technical details of the insurance.

(2) *Risk*. — Compulsory insurance applies only to the risk constituted by damage due to hail. If, before May 15, crops compulsorily insured have been completely destroyed by flood, drought or plant diseases, the institution refunds half the premium to the persons insured.

(3) *Purpose*. — Under the terms of the law, compulsory hail insurance covers all crops. Since, however, it belongs to the Council of Ministers to fix the details concerning the crops subject to compulsory insurance, the insurance will probably be confined at first to the principal crops grown in the country, namely, cereals, while the other crops may be insured optionally.

(4) *Insurance amount*. — The insurance amount is based on the yield value. Yield values are fixed by the technical section of the institution. In the case of cereals 60 per cent. of the yield value is subject to insurance, while for other crops the amount is fixed at 50 per cent. If the farmer wishes to insure higher values, he may do so up to the total yield value by taking out a voluntary insurance policy.

(5) *Financial aspects*:

(*a*) Premium rates are calculated according to the risk; they are graduated on the basis of susceptibility of the various crops to damage by hail, as well as according to local risk.

(*b*) The Government contributes 60 per cent. towards compulsory insurance premiums. The insured has therefore to pay only 40 per cent. of his premium.

(*c*) The institution has a large reserve fund. A sum of 200 million levas has been paid outright by the Government as the institution's initial capital; this sum is increased by surpluses from compulsory insurance and by the transfer of fixed quotas of certain government revenues (export tax on cereals, tax on spirits).

From the reserve fund the institution must in the first place advance the 60 per cent. subsidies on premia as prescribed by law during the seasons when losses are severe and when receipts from premia are not sufficient to cover the losses incurred.

(6) *Compensation.* — Compensation is paid on the basis of the insurance amount. No account is taken of loss under 10 per cent. which remains totally uncovered. Reductions of compensation in case of catastrophical damage are not envisaged. If the current receipts do not suffice to pay compensation as prescribed by law, the reserve fund up to a total of 3/4 of its total amount is used for the compensation of loss. Moreover the Agricultural and Co-operative Bank grants the necessary credits which are guaranteed by the State.

V. Poland.

Compulsory hail insurance of field crops (1).

A decree dated January 31, 1929, issued by the Ministers of the Interior, Finance and Agriculture authorized the voivodies to decree compulsory insurance of field crops against damage caused by hail. In each case the operation of the insurance was to be entrusted to the competent public institution which handled hail insurance. Institutions of this description existed at Posen, Warsaw and Thorn. The regulations are similar to those in force in Yugoslavia.

By 1936 no compulsory hail insurance schemes had been introduced in any of the voivodies.

VI. U. S. S. R.

Compulsory State crop insurance handled by the Gosstrach (2).

Under the terms of article 14 of the Constitution, the law of October 6, 1921, was passed forming the basis of the present organization of State insurance. Numerous orders have from time to time led to improvements in insurance which has developed in the course of years. A special insurance plan has been worked out annually.

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(1) Bibliography: ROHRBECK: Welthagelversicherung, p. 103.

(2) Bibliography: SERAPHIM: Das Versicherungswesen in Russland, in *Wirtschaft und Recht der Versicherung*, supplement of the periodical *Versicherung und Geldwirtschaft*, Berlin, 1925, pp. 1-33. — HOCHMANN: Crop insurance against bad harvests (in Russian), Gosstrach, Moscow, 1926. — RYBNIKOFF: Der Stand der Staatsversicherung in der UdSSR, in *Versicherung und Geldwirtschaft*, No. 27, July 4,

The description given below is based on the text of decree No. 1707 issued by the People's Commissaries on July 19, 1934, with supplements and amendments No. 1254, July 14, 1936, and No. 1288, August 4, 1937, as well as on all the works accessible for consultation dealing with this period. Unfortunately, it has not been possible to obtain material of more recent date. Of the numerous communications on the subject issued in earlier years many are by now out of date.

(1) *Organization.* — Insurance is a State monopoly, managed by the *Gosstrach*, a State institution which prepares the working plans, organizes the administrative machinery and drafts the statutes and tariffs. In the several republics and districts there are branches of the *Gosstrach*, as well as provincial and district agencies. The branch managements appoint local agencies; the communal agents are appointed by these last-mentioned agencies.

Besides crop insurance, the *Gosstrach* also handles many other branches of insurance, such as insurance of persons (life, accident), insurance of buildings and movable property against damage due to natural causes, insurance against the mortality of livestock, freight insurance and reinsurance.

State insurance is either voluntary or compulsory. Voluntary insurance is contracted where compulsory insurance does not cover the total value of the object to be insured and also where no compulsory insurance exists [1].

Insurance amounts, premium rates and compensation are fixed at varying amounts according to who the insured is. For this purpose a distinction is made between collective farms (*Kolkhós*), the members of collective farms (*Kolkhós peasants*) and individual farms (*individual peasants*). As compared with individual peasants, the *Kolkhós* enjoy substantial advantages. They are much better protected by insurance and pay lower premium rates.

(2) *Purpose.* — The following may be distinguished among the crops insured by the *Gosstrach:* cereals (wheat, rye, barley, oats), grazing and other graminaceous plants; root crops (potatoes, beets, etc.); pulse (beans, peas, lentils, etc.); fruits (vines and fruits); special and industrial crops (flax, hemp, hops, sunflowers, cotton, rice, soya and tobacco).

Forests are excluded from insurance.

(3) *Risk.* — The risks covered are those due to hail, including rain and storms, field fires, moisture, floods and frost.

1927, pp. 243-246. — By the same author: Die Erweiterung des Prinzips der obligatorischen Versicherung in der UdSSR, in *Deutsche öffentlich-rechtliche Versicherung*, No. 14, July 15, 1930, pp. 125-127. — By the same author: Das Versicherungswesen in der Union der sozialistischen Sowjetrepubliken, in *Deutsche öffentlich-rechtliche Versicherung*, No. 19, October 1, 1934, pp. 225-228; No. 20, October 15, 1934, pp. 237-239. — v. SCHWANEBACH: Die Agrar-Zwangsversicherung in der Sowjet-Union, in *Deutsche öffentlich-rechtliche Versicherung*, No. 1, January 1, 1933, pp. 1-4. — MYSLIVEC: Das landwirtschaftliche Versicherungswesen in der Sowjet-Union, in *Oesterreichische Revue*, No. 5, February 3, 1936, pp. 43-48. — GUN: Die Sachversicherung in der Sowjet-Union, in *Versicherungsarchiv*, No. 12, June, 1937, pp. 851-859. — ROHRBECK: Welthagelversicherung, pp. 14, 104-106, 214-223.

(1) Voluntary insurance was originally but little developed. A special law on voluntary insurance was promulgated on July 27, 1934. Later instructions were issued for the operation and facilitation of voluntary insurance, and compulsory insurance was reduced to the minimum required by public interest. It is only since 1936 that voluntary insurance has spread to any considerable extent.

In the case of some technical and special crops insurance was later extended to plant diseases and pests and to drought. These crops are therefore now completely covered against bad harvests.

(4) *Insurance amount.* — The amounts to be insured under compulsory insurance are determined schematically per hectare in the annual insurance plan drawn up by the head office of the *Gosstrach* in roubles for farm crops and in metric quintals for industrial crops.

Farm crops are grouped under several heads. In the different republics, too, the insurance amounts are fixed at various sums in consideration of the different productive capacity of the soil and the varying degrees of intensification of farming. Insurance amounts are adapted to individual conditions in the different provinces and districts. The normal deviation of premium rates from the average is 10 per cent.

The insurance amounts are also graduated according to the degree of socialization prevailing on the farm. The following table, based upon an official table for 1937, illustrates what has just been said.

Average compulsory insurance amounts for farm crops in roubles per hectare in 1937.

Republics	Type of farm	Cereals and legumes	Potatoes, other root crops	Market gardens, orchards, vineyards
Great Russia	Collective farms (Kolkhós)	50	180	450
	Members of collective farms (Kolkhós peasants)	45	160	400
	Individual farms (Individual peasants)	45	150	375
Ukraine	Kolkhós	60	175	450
	Kolkhós peasants	50	160	400
	Individual peasants	50	150	375
White Russia	Kolkhós	50	150	400
	Kolkhós peasants	45	135	350
	Individual peasants	45	125	325
Transcaucasia:				
Azerbaidshan	Kolkhós	82	250	745
	Kolkhós peasants	60	180	610
	Individual peasants	60	175	575
Georgia	Kolkhós	80	190	1,010
	Kolkhós peasants	60	135	890
	Individual peasants	60	130	820
Armenia	Kolkhós	90	140	1,010
	Kolkhós peasants	60	125	690
	Individual peasants	60	100	670
Usbekistan, Turkmenistan, Tadschikistan	Kolkhós	76	175	900
	Kolkhós peasants	54	140	800
	Individual peasants	54	130	750

Compulsory insurance amounts for industrial and special crops are determined in metric quintals for each separate crop. Here, too, the *Kolkhós* enjoy higher cover than the individual peasants.

Average compulsory insurance amounts for some special and industrial crops in metric quintals per hectare [1].

Republics	Type of farm	Rice	Cotton	Yellow tobacco	Black tobacco	Sunflower	Kenaf	Soya	Hops
Great Russia	Kolkhós	12	4	6.6	13	4	22	5.5	7
	Kolkhós peasants and individual peasants .	10	4	6.0	11	3.2	15	5.0	6
Ukraine	Kolkhós	—	2	7.0	12	—	16	5.0	6
	Kolkhós peasants and individual peasants .	—	1.5	7.0	12	—	12	4.0	5
White Russia	Kolkhós	—	—	—	9	—	—	—	—
	Kolkhós peasants and individual peasants .	—	—	—	8	—	—	—	—
Transcaucasia	Kolkhós	—	5	6.0	—	—	16	6.5	—
	Kolkhós peasants and individual peasants .	—	4	5.0	—	—	12	4.5	—
Usbekistan . . . . / Turkmenistan . . . / Tadschikistan . . .	Kolkhós	—	5-7	7.0	9	5	22	4.0	—
	Kolkhós peasants and individual peasants .	—	4-6	6.0	8	4	15	3.2	—

(1) According to SCHWANEBACH, *op. cit.*

The compulsory insurance amounts are very small, because, ever since the promulgation of the law dated July 27, 1934, the application of compulsory crop insurance is restricted to the minimum required by public interest. Consequently, there is a wide margin to be covered by supplementary voluntary insurance which is permitted to cover the total value of the crop.

(5) *Premium.* — Average premium rates for compulsory crop insurance are fixed under the annual insurance plan as a percentage of the insurance amount. They are collected in two or three instalments on fixed dates, the first instalment falling due on September 15.

Different standards are adopted in calculating the premium rates for farm crops, on the one hand, and for industrial and special crops, on the other hand.

(*a*) In the case of insurance of farm crops, two categories of risks are distinguished, while the amount of the premium is graduated according to the degree of socialization of the farm. While premiums for hail and field fires are fixed at varying levels in the different republics belonging to the Union, premium rates for insurance against frost and damp are the same throughout all the republics.

The table below, based upon an official table for 1937, shows the amounts of the premia.

Compulsory insurance premium rates for farm crops against risks due to natural causes expressed in per cent. of insurance amounts.

Republic	Type of farm	Insurance of farm crops against	
		hail (including rain, storms, tempests and field fires)	frost, damp and floods
Great Russia	Kolkhós	1.15	
	Kolkhós peasants	1.80	
	Individual peasants	2.30	
Ukraine	Kolkhós	1.30	
	Kolkhós peasants	2.10	
	Individual peasants	2.65	
White Russia	Kolkhós	1.20	
	Kolkhós peasants	1.90	
	Individual peasants	2.40	
Transcaucasia: Azerbaidshan	Kolkhós	2.42	2.10
	Kolkhós peasants	3.80	3.90
	Individual peasants	4.64	5.00
Georgia	Kolkhós	2.93	
	Kolkhós peasants	4.60	
	Individual peasants	5.58	
Armenia	Kolkhós	3.12	
	Kolkhós peasants	4.80	
	Individual peasants	5.87	
Usbekistan, Turkmenistan, Tadschikistan	Kolkhós	—	
	Kolkhós peasants	—	
	Individual peasants	—	

(*b*) In general insurance against bad harvests of special and industrial crops premium rates are determined according to type of crop and graduated according to the degree of socialization. Premium rates are the same throughout the whole of the U. S. S. R.

The following table has been taken from Schwanebach's article, op. cit.

Compulsory insurance premium rates for some special and industrial crops expressed in per cent. of insurance amounts.

Type of farm	Cotton	Tobacco	Soya Kenaf	Rice	Hops Sunflowers
Kolkhós	2.20	3.30	4.40	4.95	5.50
Kolkhós peasants, Individual peasants	3.60	4.80	7.56	7.20	8.40

A considerable reduction (up to 50 per cent. in 1937) is granted on the official rates to persons who have in some way deserved well of their country and to those who have succeeded in obtaining a particularly good yield.

(6) *Compensation.* — The insurance amount constitutes the basis of compensation. In case of total loss of the crop, the whole of the insurance amount is paid as compensation. In the case of partial loss, compensation is determined in accordance with the loss incurred.

In the case of damage to special and industrial crops, where the insurance amounts are determined in metric quintals, compensation is paid only in so far as the quantity harvested is less than the quantity insured.

Formerly, slight damage within the limits of 25 to 200 roubles, was excluded as trifling damage. We do not know whether this exclusion still exists.

No compensation is paid for damage for which the insured is himself responsible.

Compensation is paid immediately and at latest at harvest time. The instalments of premiums still due may be deducted from the compensation.

(7) *Reserves and reinsurance.* — The *Gosstrach* enjoys absolutely ideal conditions for the mutual compensation of risks owing, on the one hand, to the insurance monopoly it possesses and to the compulsory character of the insurance which forces the majority of the citizens to contract insurance and, on the other hand, to the diversity of the risks from the standpoint of damage and objects insured as well as to the vastness of the territory over which the insurance operates, amounting to some 22 million sq. km. Consequently, the *Gosstrach* does not require to reinsure, nor does it even need to maintain a reserve fund.

Nevertheless, the *Gosstrach* has large reserves constituted by operation surpluses. It also has recourse to reinsurance, which, however, covers chiefly the serious risks of maritime freight insurance.

(8) *Summary.* — The insurance amounts shown below give an idea of the tremendous progress made by State insurance [1], which has developed more and more in relation to the experience gradually gained.

	1925/26	1927/28	1934
	Insurance amounts in millions of roubles		
For crop insurance	841	2,497	15,130
For real estate insurance, insurance on movable property and against the mortality of livestock.	4,765	10,431	30,992
Total	5,606	12,928	46,122

During the first fifteen years of its activity (1922-1936), the *Gosstrach* has collected a total of 6,500 million roubles in insurance premia, 3,100 million of which have had to be disbursed as compensation. The turnover has therefore

[1] RYBNIKOFF, *op. cit.* 1934, p. 238.

been very satisfactory. The large surpluses obtained from premia have made it possible not only to form considerable reserves—on January 1, 1936, the reserve fund totalled 983.7 million roubles— but also to earmark large sums (15 per cent. of premiums collected), for the prevention of risks.

GUN gives the following figures for compulsory crop insurance during the years from 1934 to 1936.

Progress of crop insurance in the U. S. S. R. from 1934 to 1936.

Insurance branch	Year	Area insured in million hectares	Insurance amounts in million roubles	Premiums calculated	
				in million roubles	in %
Hail insurance including rain, storms, field fires.	1934	110.4	8,395.9	125.0	1.49
	1935	111.5	8,450.4	125.1	1.48
	1936	110.5	8,548.1	117.4	1.37
Insurance against damp, frost and flood . .	1934	87.5	6,400.3	170.6	2.67
	1935	87.5	6,601.1	162.1	2.46
	1936	87.5	6,627.7	160.7	2.42
Insurance against bad harvests.	1934	2.66	474.7	16.7	3.52
	1935	2.50	500.4	17.3	3.46
	1936	2.59	517.2	17.3	3.34

As will be seen from the above table, insurance amounts have increased without interruption, while, on the other hand, the amount of premia has constantly decreased.

VII. Japan.

Combined compulsory crop insurance (1).

(1) *Organization.* — The organization of insurance is based on the law No. 3372 dated April 1, 1938, and on the executive regulations No. 3617 dated January 27, 1939. This law came into force on April 1, 1939 (2).

Insurance rests on the basis of the assistance granted to peasants by the agricultural co-operative associations in case of loss of their crops. It is not the individual peasants who figure as the insured but the agricultural co-operative associations belonging to the various communes (communal agricultural

(1) Bibliography: OBAYASHI, R.: Die neue japanische Agrarversicherung, in *Neumanns Zeitschrift für Versicherungswesen*, No. 12, March 22, 1939, pp. 278-280. — SHIRASUGI, S.: Die Elementarschädenversicherung in Japan, in *Schriftenreihe des Instituts für Versicherungswissenschaft der Universität Köln*, Book 5, pp. 5-27. Supplementary communications from Professors S. Shirasugi, Kobe and R. Obayashi, Tokio.

(2) A French translation of these enactments is published in the *Annuaire International de Législation Agricole* for the year 1939, pp. 520-541 and 541-555.

associations), into which the peasants or silk worm breeders are grouped. The protection of insurance is provided to the individual peasant through the communal agricultural association to which he belongs.

(2) *Purpose.* — Only crops of vital importance to the country are insured: rice, mulberry leaves and cereals (wheat, barley, rye, oats). These crops represent approximately 70 per cent. of the total agricultural production of the country.

(3) *Risks.* — The insurance provides for the principal risks: hail, storms, floods and drought in general and to a limited extent against damp (cereals), frost (mulberry leaves) and certain plant diseases (rice).

(4) *Insurance amount.* — Insurance amounts are determined schematically by the *tan* (= 0.9917 *are*) for the various crops; they are:

for rice	20 *yens* per *tan*
» mulberry leaves	20 » » »
» cereals	10 » » »

In areas where the yield is especially high or low, these insurance amounts may respectively be doubled or halved.

Normal insurance amounts are very low; they only represent between 20 and 30 per cent. of the value of the crops insured.

(5) *Premium.* — The calculation of premium rates is based on detailed statistics concerning loss over the period from 1918 to 1935. It covers 21 types of crop and 10 different risks due to natural causes. In these statistics the risk is calculated for each commune according to type of crop, to nature of risk and to local conditions. The calculation of premium rates is consequently strictly individual.

Premia collected up to the present have shown the following averages for the whole country: rice 3.78 per cent.; mulberry leaves, 2.92 per cent.; cereals, 1.69 per cent. (1).

(6) *Compensation.* — Compensation is paid within the limits of insurance amounts. Accordingly, it does not correspond to the ratio between loss sustained and total crop value; when the loss is but slight, the rate of compensation is considerably lower, as will be seen from the following scale:

Extent of loss %	Compensation in *yens* per *tan*	
	for rice and mulberry leaves	for cereals
1– 29	—	—
30– 49	2	1
50– 59	3	1.5
60– 69	6	3
70– 79	10	5
80– 89	14	7
90–100	20	10

(1) *Conf.* SHIRASUGI, p. 12, note 1.

As will be seen, loss under 30 per cent. is not compensated, while the compensation paid on moderate loss is extremely low. Only in the case of total loss is compensation paid in full to the extent of the insurance amount.

If the district insurance association does not possess adequate funds for the payment of compensation as prescribed under the law, each compensation sum is reduced in proportion to the deficit.

(7) *Reinsurance.* — Reinsurance is particularly important in Japanese crop insurance, since the district agricultural insurance associations are, as a rule, small and have a limited economic capacity. Under the terms of the law, the district agricultural insurance associations are compulsorily reinsured to the extent of 70 per cent. of their liabilities by the provincial agricultural insurance federations, in each of the 47 provinces. The Government accepts a given annual surplus of loss in retrocession from the provincial agricultural insurance federations.

(8) *Summary.* — Japanese crop insurance is still in its initial stage. Its extension is envisaged to other crops and other risks beside those already insured. Moreover, the rate of compensation is still insufficient, considering the smallness of the insurance amounts, and particularly the fact that the compensation paid in case of partial loss cannot possibly offer adequate protection to the peasant. This is why the aid given by the communal agricultural associations to their members in case of loss has not been abolished, and may even continue to be paid as a supplement to the compensation paid on the insurance.

It has unfortunately been impossible as yet to obtain reliable figures concerning the actual working of Japanese crop insurance.

VIII. Canada.

Compulsory State hail insurance (1).

Eastern Canada does not suffer much from hail, while, on the contrary, the interior of the country, namely the provinces of Saskatchewan, Manitoba and Alberta, are often devastated by severe hail storms. In these provinces hail insurance is regulated by provincial enactments.

Compulsory insurance is organized along the following lines:

In Saskatchewan the first law concerning compulsory hail insurance was published in 1912. After the heavy losses sustained in 1916, a new law was promulgated on March 10, 1917.

At the present time the law in force is the Municipal Hail Insurance Act, 1930, as amended on April 13, 1932.

(1) Bibliography: MANES: Staatsbetrieb, p. 107. — Municipal hail insurance in Alberta, in *International Review of Agriculture*, No. 4, April, 1921, pp. 202-205 E. — The Saskatchewan Municipal Hail Insurance Association, in *International Review of Agriculture*, No. 2, March, 1927, pp. 40-41 E. — ARCOLEO: Agricultural Insurance in Canada, in *International Review of Agriculture* No. 7, July, 1932, pp. 198-206 E. — WEISS, *op. cit.*, p. 131. — ROHRBECK: Welthagelversicherung, pp. 111-114, 227.

In Manitoba compulsory hail insurance was introduced under the Act respecting Intermunicipal Hail Insurance, dated February 20, 1914.

In Alberta compulsory insurance was in force under the terms of the law dated February, 1919, which remained effective from 1919 to 1923. After 1924 the insurance institution only handled voluntary hail insurance. The insurance institution was closed in 1937 because the banks refused to give it annual credits.

The regulations in force in Saskatchewan have served as model for the other two provinces.

(1) *Organization.* — Insurance is handled by the Saskatchewan Municipal Association, constituted as a juridical person. It consists of representatives of all the communities desirous of introducing insurance into their districts. Among other things, the functions of the association consist in the formation of a reserve fund and the distribution of compensation among the communities belonging to the association.

The introduction of insurance in the various communities is decided upon by the vote taking place in each of the communities concerned. The communal authorities must put the matter to the vote on the request of at least 50 taxpayers made before November 1 of any given year. The regulations governing are subject to ministerial approval.

If the resolution concerning the introduction of insurance is passed, insurance becomes compulsory for all the farmers. Under certain conditions, however, a farmer may avoid the liability to insure.

Private underwriters, limited liability companies and mutual associations work in competition with the government institutions handling compulsory municipal insurance.

(2) *Risk.* — The only risk insured against is that of damage by hail. If the crop is totally or partially destroyed by natural visitations other than hail the farmer may cancel his insurance for the year in question or demand a reduction on his hail insurance premium.

(3) *Purpose.* — This insurance covers all field crops in Saskatchewan. The following crops are listed: wheat, oats, barley, rye, spelt, flax, common beans, buckwheat, graminaceous plants, clover, sunflowers. In Alberta insurance only covered the first six of the crops listed above.

(4) *Insurance amounts.* — In Saskatchewan the amount to be insured was fixed at 5 dollars per acre. In Alberta in 1919, it was either 8 or 6 dollars per acre at the option of the insured person. In 1919, 94 ½ per cent. of the area insured was insured for 8 dollars.

(5) *Premium.* — The Saskatchewan law establishes a flat acreage rate of 4 cents per acre calculated on both cultivated and uncultivated land. A supplement to this rate is added consisting of a premium on cultivated land depending on local risk. This supplementary rate amounts to 5, 6 and 8 per cent. in the various hail insurance districts.

The premia are collected along with the municipal taxes.

In Alberta the premium was originally fixed at a uniform rate throughout the whole province on the basis of loss incurred, and was payable up to December 15. If the farmer wished to cancel his insurance because his crop had been destroyed by some other risk, he was obliged all the same to pay an area tax of 3 or 4 cents.

(6) *Compensation.* — Every Saskatchewan farmer who has paid his supplementary premium is entitled to compensation. Compensation is calculated according to the heaviness of loss. Ten cents per acre are paid for each 1 per cent. of loss. No compensation is paid for losses under 10 per cent. of the total value of the crop. The amount of compensation paid for total loss fixed at a maximum of 8 dollars per acre, the uncovered margin being 5 per cent.

In Saskatchewan, when the underwriter's funds are not sufficient to cover the loss incurred all compensations are proportionately reduced. Compensation must be paid before December 15.

In Alberta the insurance institution received annual bank credits for payment of compensation, these credits being refunded after the premia had been collected.

(7) *Results of activity.* — We have been in a position to obtain information concerning the results of Government hail insurance activity only for the provinces of Saskatchewan and Alberta. The data have been obtained from various sources and concern the following years:

Municipal hail insurance in Canada.

Year	Number of communities or area insured	Insurance amounts $	Premia		Losses paid		
			$	%	$	% of insurance amount	% of premium
		Saskatchewan					
1915	139	?	917,000	?	671,000	?	73.17
1926	5,774,833 Acres	ca. 25,000,000	1,364,214	5.46	1,270,000	5.08	93.09
1929	7,953,139 Acres	39,765,695	1,408,047	3.54	614,475	1.55	43.64
		Alberta					
1919		37,000,000			2,393,801	6.47	
1920							
1921		21,000,000	5,772,814	8.02	2,150,000	10.24	83.91
1922		14,000,000			300,000	2.14	
4 years		72,000,000	5,772,814	8.02	4,843,801	6.73	83.91

The losses incurred under government insurance in Saskatchewan will be seen from the following figures:

The compensation paid by the institution in normal years remained under 1 million dollars; in 1916, 1919, 1921, 1923 and 1926, however, the losses incurred were very heavy. In 1916 the damage amounting to about 1.5 million dollars,

could only be compensated up to 40 per cent. During the other years when damage was severe, payments made by the institution were as follows:

Year	Number of cases of loss	Compensation paid
1919	7,838	1,916,443
1921	7,633	1,763,000
1923	6,130	1,258,000
1926	5,240	1,270,000

In all, from 1912 to 1926, the institution paid out 11.5 million dollars in compensation.

IX. North Dakota.

Compulsory State hail insurance (1).

Owing to the high premium rates demanded by private underwriters for crop insurance against hail, a state institution for hail insurance was founded in the State of North Dakota in 1911, under the name of Hail Insurance Department of the State of North Dakota. The institution worked solely with its own funds, the government assuming no financial responsibility for its operations.

Insurance was voluntary. The insurance amount was established at 8 dollars per acre, the premium rate, which was only 20 cents in 1911 and 1912, was raised to 30 cents as from 1913. The premia were collected in spring.

There was very little demand for this voluntary insurance, because, as a rule, farmers in springtime have no money for paying their premia. Since the premia were very much too low (at the outset only 1/4 of the rates charged by private underwriters), in no single year was the institution able to pay compensation in full. The results of its activity were therefore far from satisfactory, as may be seen from the following table:

Year	Number of policies	Insurance amounts $	Premia $	Losses $	Compensation $	Compensation in per cent. of loss
1911	1,011	1,044,782	26,120	35,171	24,620	70
1912	2,505	2,653,606	66,340	114,845	63,165	55
1913	773	722,975	30,390	33,550	29,524	88
1914	761	749,203	28,638	42,865	27,862	65
1915	580	554,104	21,901	27,844	20,883	75
1916	845	883,023	33,117	87,171	33,125	38
1917	300	318,792	11,954	16,655	10,326	62
1918	475	511,382	19,910	33,142	17,565	53

(1) Bibliography: Annual Report of the Hail Insurance Department of the State of North Dakota for the year 1930 including Data for 12 Year Period 1919-1930. Annual Reports for 1931 et seq. — MALEK: Die Ernteertragsversicherung gegen Elementarschäden in Nordamerika, in *Zeitschrift für die gesamte Versicherungs-Wissenschaft*, 1926, pp. 340 e seq. — MC CAHAN, D.: State Hail Insurance, in *Journal of American Insurance*, February, 1931. — ARCOLEO: Hail Insurance in the United States of America, in *International Review of Agriculture*", No. 4, April, 1934, pp. 136-153 E. — ROHRBECK: Welthagelversicherung, pp. 117, 118, 234. — Data obtained from the Hochschulinstitut für Versicherungswissenschaft, Berlin, and made available by the courtesy of the Director, Dr. Süss.

Compulsory insurance was introduced by the law of November 5, 1918 (Known as the Old Hail Law), which came into force on March 1, 1919. The law remained in force, with various amendments, until 1931.

(1) *Organization.* — There was no direct compulsion to contract hail insurance. Every owner of cultivated land was, on the other hand, compelled to pay a flat acreage tax. Compulsory hail insurance also came automatically into force if the farmer did not declare that he did not wish to insure himself before June 15 of the year in course. There was therefore conditional compulsion (semi-compulsory insurance).

The government institution worked in competition with the private insurance companies.

(2) *Risk.* — The insurance applies to hail only. Assessors are instructed that losses of yield due to drought, damage caused by insects, plant diseases, etc. are not to be taken into consideration.

(3) *Purpose.* — In the text of the law reference is made only to insured crops. In practice insurance covered chiefly the following crops: wheat, rye, barley, oats, maize, millet and flax.

(4) *Insurance amounts.* — Insurance amounts were fixed at a maximum of 7 dollars per acre in 1919. A law amending the original one was passed on March 10, 1921, which permitted the farmer to have recourse to voluntary insurance in order to raise the insurance amount from 7 to 10 dollars per acre before July 1.

(5) *Financial aspects.* — The receipts of the State institution are as follows:

(*a*) flat acreage tax. This amounted to 3 cents per acre from 1919 to 1922 and to 1 cent par acre from 1923 to 1927. It was used for the constitution of a reserve fund up to 4 million dollars (¹).

(*b*) indemnity acreage tax. Under the terms of the Old Law this was collected only after the harvest, and its amount was established at a flat rate for every part of the State according to the loss incurred. The maximum premium rate allowed to cover an insurance amount of 7 dollars per acre was 50 cents. After the supplementary law of March 10, 1921, was passed, enabling the farmer to raise the insurance amount from 7 to 10 dollars until July 1, the premium rates were increased in proportion (²).

An amendment passed on March 7, 1925 graduates the hail insurance premium according to local risks in four different rates, running from 22 to 69 cents according to the losses incurred (see table given on page 203).

(¹) Until 1927 the flat tax brought in a total of 4,693,367 dollars. As from 1928 this tax ceased to be collected. The reserve fund amounted to 4,049,318 dollars at the end of 1930 (1930 Report, p. 46).

(²) The amounts of the premia charged by the State institution were considerably lower than those of the private companies. The premium paid for hail insurance to the State institution during the twelve years period 1919-1930, worked out at 5.15 per cent., as against 10.28 per cent. paid to private insurance companies (1930 Report, pp. 72-73).

Business turnover in state hail insurance, North Dakota.

Year	Acreage insured		Insurance amount $	Receipts					Number of risks	Expenses
				Flat acreage tax		Insurance premium		Total $		Compensation paid $
	Acres	% of cultivated area		per acre cents	Total $	Rate per acre in cents	Total $			
Compulsory										
1919	12,408,351	67	86,858,457	3	855,092	25	3,105,634	3,960,728	12,852	3,489,240
1920	12,053,743	63	84,376,197	3	835,479	25	3,018,489	3,853,968	14,400	3,348,298
1921	11,363,481	61	81,737,655	3	834,401	44	5,208,612	6,043,013	21,081	4,773,280
1922	9,187,985	49	65,730,507	3	818,435	42	3,972,215	4,790,650	18,300	3,537,555
1923	7,764,811	42	55,386,881	1	273,936	50	3,954,730	4,228,666	25,667	4,491,448
1924	5,468,946	30	38,768,142	1	269,583	33	1,827,410	2,096,993	10,653	1,533,486
1925	6,360,126	33	45,255,345	1	270,143	23, 27, 32, 36	1,668,342	1,938,485	8,100	1,367,293
1926	6,136,813	31	43,478,524	1	269,678	28, 33, 39, 44	2,015,475	2,285,153	9,744	1,697,082
1927	7,777,560	41	55,583,460	1	266,618	34, 41, 47, 54	3,485,301	3,751,919	16,780	3,274,560
1928	6,689,118	34	47,486,943	—	—	43, 51, 60, 69	3,983,353	3,983,353	20,526	3,730,068
1929	5,910,594	31	41,838,827	—	—	22, 27, 31, 36	1,543,783	1,543,783	8,151	1,555,063
1930	6,486,954	34	46,227,693	—	—	27, 32, 38, 43	2,064,679	2,064,679	9,848	1,877,571
1931	4,092,684	22	28,790,008	—	—	26, 32, 37, 42	1,213,137	1,213,137	6,610	970,323
Voluntary										
1932	1,162,321	6	8,701,704	—	—	19, 32, 38, 45, 51	475,967	475,967	3,143	410,303
1933	1,080,951	6	7,130,858	—	—	9, 15, 18, 21, 24	216,645	216,645	1,946	218,466

(c) in order to help it in its work, under the Old Law the State granted the institution a credit of 50,000 dollars. From 1919 on this credit was increased to 100,000 dollars.

(6) *Compensation.* — Under the terms of the law of 1921, the reduction of compensation in case of insufficient funds was abolished. The Hail Department in case of need was authorized to borrow. Since in 1923 it was not possible to cover more than 80 per cent. of the loss subject to compensation out of the normal receipts, a law was passed in 1925 according to which 900,000 dollars were paid to farmers who had suffered damage from hail in 1923; this amount was paid out of the reserve fund constituted from the surpluses from the flat acreage tax.

The Old Law did not provide for uncovered margins; none were introduced until 1932 when the margin not subject to compensation was fixed at 10 per cent.

(7) *Results of activity.* — The results obtained with compulsory hail insurance are shown in the statistical table given below. They were not very satisfactory. Insurance amounts showed a steady decline. A large proportion of the premia could not be collected, and this laid an exceedingly heavy burden on the Department. Consequently, compulsory insurance was abandoned in 1931. After that date, the acreage insured, the insurance amounts and the premia showed a further sharp decline, as may be seen for the years 1932 and 1933, which are included in the table. The further fall in business is explained by the fact that the premia had now to be paid simultaneously with the application for insurance. The decline in prices of farm products also had a serious effect on the shrinkage of compulsory insurance, especially as many farmers, owing to the low price level, considered that insurance was superfluous.

We are not interested here in the progress of voluntary State hail insurance in North Dakota under the New Hail Law of July 1, 1931, which came into force in 1932.

X. South Dakota.

Compulsory State hail insurance (1).

State hail insurance was introduced in South Dakota in 1919 on the model of that in force in North Dakota. The law was amended in 1929.

(1) *Organization.* — There is no direct compulsion to contract hail insurance. All arable land is, however, automatically insured with the State institution unless, prior to June 1, the farmer declares that he does not wish to insure with this institution. The obligation to insure is, therefore, only conditional.

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(1) Bibliography: WALKER, D. E.: Hail Insurance in South Dakota, in *Dakota Farmer*, 1926. — MALEK: Die Ernteertragsversicherung gegen die Elementarschäden in Nordamerika, in *Zeitschrift für die gesamte Versicherungs-Wissenschaft*, 1926, pp. 341-342. — Mc CAHAN, D.: State Hail Insurance, in *Journal of American Insurance*, February, 1931. — ARCOLEO: Hail Insurance in the United States of America in *International Review of Agriculture*, No. 4, April, 1934, pp. 136-153 E. — ROHRBECK: Welthagelversicherung, p. 118.

Besides the State institution, this form of insurance is also handled by private companies. If a farmer refuses the State insurance he may take out a policy with a private company.

(2) *Risk.* — The insurance only covers risk of damage due to hail.

(3) *Purpose.* — The following crops are enumerated in the law: wheat, oats, barley, rye, maize, flax, sugar cane, millet and buckwheat.

(4) *Insurance amount.* — Insurance amounts were fixed at a flat rate of 10 dollars per acre. By making a special request, a farmer could insure for only 5 dollars per acre.

(5) *Premium.* — The premium was originally graduated in South Dakota according to local risks (35, 40, 42 and 45 cents). The law passed in 1929 contains 7 premium rates, namely, 25, 35, 45, 60, 75, 90 cents and one dollar per acre. If the insured person has made special application for an insurance of only 5 dollars per acre, the premium rates listed above are reduced by half.

Premia must be paid before the hail season and are collected like taxes. If they prove to be inadequate, supplementary premia are collected. In 1924 the supplementary premium amounted to 100 per cent. of the original.

(6) *Reserves.* — The institution established a reserve fund in 1919. It was to have been increased to 2.5 million dollars. Before this sum was reached, the premium rates could not be reduced any further. After the first year, which was very satisfactory, 900,000 dollars were transferred from the annual surplus to the reserve fund. On December 31, 1922, the reserve fund was 615,216 dollars. At the outset there was no reinsurance.

State hail insurance in South Dakota.

Year	Insurance amount	Premia (2)		Number of losses	Compensation paid (3)		
		$	%		$	in % of insurance amount	in % of premia (2)
1919	—	1,056,462	—	—	338,068	—	32
1920	—	1,092,410	—	—	983,169	—	90
1921 (1)	30,136,290	984,154	3.27	7,326	1,231,668	4.09	125
1922 (1)	32,421,540	1,202,995	3.71	7,013	1,200,925	3.70	100
1923	—	1,226,205	—	—	1,632,997	—	145
1924	—	2,300,325	—	—	2,254,319	—	98
1925	—	644,779	—	—	573,853	—	89
1926	—	617,980	—	—	414,047	—	67
1927	—	—	—	—	—	—	—
1928	—	442,854	—	—	—	—	—
1929	—	481,580	—	—	—	—	—
1930	7,806,232	—	—	—	390,931	5.01	—

(1) LENGYEL: *op. cit.*, p. 23.
(2) ARCOLEO: *op. cit.*, pp. 159-160 E.
(3) Calculated on the basis of rates quoted by Arcoleo.

(7) *Compensation.* — Compensation is paid on the basis of the insurance amount. It falls due on October 15. Should funds be insufficient, compensation is not reduced, but the institution collects supplementary premia.

(8) *Results of activity.* — Owing to absence of reports concerning the institution's activity, only the figures on page 205 are available for publication.

XI. Argentina.

Compulsory agricultural insurance [1].

In Argentina the National Bank has taken an active interest in agricultural insurance. Originally the Bank required that an insurance be contracted as guarantee for agricultural credits. Since 1919 the Bank itself has been dealing in this type of insurance.

During the past few years the Bank has undertaken extensive studies with the idea of establishing general crop insurance. A bill for compulsory general crop insurance was submitted in 1941.

According to this bill, all capital invested in agriculture would have to be insured against all risks due to natural causes. The only losses not covered would be those represented by the failure to make profits.

In order to finance this insurance a 6 per cent. loan would be floated for a total of 10 million pesos. The loan would be repayable with 75 per cent. of the annual insurance surpluses, the remaining 25 per cent. being allocated to the general reserve fund.

It has not been possible so far to ascertain whether this bill had since been passed.

PART III.

Conclusions concerning liability to insure in compulsory crop insurance.

I. General considerations.

Every form of compulsory insurance is merely a means for attaining given political, social or economic objects in the general interest. It therefore never constitutes an end in itself. Since to a certain extent compulsory insurance offers serious disadvantages, it sometimes represents even an inevitable evil.

Compulsory insurance should consequently not be introduced unless it is to the general interest, and it should moreover never go beyond the limits set by the general object it is intended to attain.

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[1] Bibliography: Argentine Republic: The National Mortgage Bank and the Latest Regulations Concerning It, in *International Review of Agriculture*, No. 6-7, June-July, 1921, p. 348 E. — *The Review*, London, No. 3565, October, 17, 1941, p. 429.

It is all the more necessary to limit compulsory insurance in respect of the essential conditions of its application and of its extent because it is perforce accompanied by serious disadvantages which must be accepted in consideration of the general interest in it, but which scarcely seem acceptable when the general interest either does not or has ceased to exist.

But even when the insurance is to the general interest and when this interest cannot be served without creating a liability to insure, it becomes necessary to seek the most suitable methods for achieving as completely as possible the desired objects of general interest, on the one hand, and, on the other, for restricting, in so far as possible, the disadvantages inherent to such liability.

II. Constituents of compulsory crop insurance.

Every scheme of compulsory crop insurance has two constituent parts, one objective and the other subjective.

(1) The point of departure consists of the objective constituent, namely, of the conditions prevailing in the agriculture of a given country, province or region. In this connection, special attention should be paid to the economic importance of agriculture in the country concerned, to its profitableness, to the crops produced, to the extent of its intensification, to the frequency of damage and to the facilities available to the farmers for insuring against loss.

(2) The subjective constituent consists in the assessment of the objective factors by public bodies and in the decisions taken by them in connection with the introduction, organization and limitation of compulsory insurance.

This subjective constituent explains why the problem of knowing whether and, if so, in what way compulsory insurance should be introduced in a region has been solved in very different ways at the same time and under practically similar agricultural conditions. This is proved by experience in several of the States of the United States and in some of the Canadian provinces, as well as in Yugoslavia. A more or less satisfactory solution is reached according to the degree of understanding brought by the competent authorities to the agricultural interests concerned and to the technical aspects of insurance.

III. General interest in crop insurance.

Whether and to what extent crop insurance is to the general interest is a question which can only be answered by reference to a concrete case.

Here, however, certain considerations of a general character have also to be taken into account:

(1) Wherever there is no general interest in agricultural circles for the protection deriving from insurance, whether this interest has been openly expressed in the form of a request or whether it merely exists in latent form, there can be no question of general interest.

This is particularly true in the following cases:

(*a*) when the financial risk is relatively small. If a farmer has invested only a small amount of work and capital in his production, as is the case in

extensive farming, *e. g.*, grazing and pasturage, as well as in the primitive forms of farming, individuals have but little interest in insurance, as is proved by experience obtained with hail insurance; general interest in insurance is therefore lacking,

(*b*) when the risk from natural causes is relatively small. If the farmer is likely to suffer but slightly from loss due to natural causes and when the fluctuations in his return due to natural causes are insignificant, he will not as a rule feel any desire to cover the risk by insurance; in this case, also, there will be no general interest in insurance.

(2) A more general interest—evident or only latent—in crop insurance will not therefore be awakened unless a fairly serious financial risk exists and unless at the same time the income from farming is also liable to considerable fluctuations under the influence of one or several natural risks, either due to the special intensity of certain natural visitations, or as the result of the special liability of the chief crops in a country to suffer from particular forms of damage. This more general interest in agricultural circles constitutes the first essential condition of the existence of public interest in insurance.

(3) But the more general interest of agricultural circles in insurance does not become public interest unless agriculture in the country concerned employs a large part of the population, as is the case in the Balkans, in several of the States belonging to the North American Union or in Japan.

(4) The general interest of the individual, as well as public interest, in an insurance may either be permanent or may depend on a crisis and, consequently, be of a transitory character. This is why, for instance, one finds an increased interest in the protection given by insurance in time of war, which disappears, however, at the same time as the crisis to which it was due.

Generally speaking, only a permanent public interest could serve as a point of departure for compulsory insurance, while an interest of merely transitory character could be met by other government measures, such as the provision for the interested parties of adequate facilities for voluntary insurance.

IV. The carrying-out of compulsory crop insurance schemes.

As the existence of a special interest, whether evident or latent, in crop insurance constitutes the starting point of public interest, without which it is impossible to introduce the liability to insure, it is obvious that no scheme of compulsory insurance can be put into effect against the unanimous will of the farmers as a body.

The authorities who have not taken into account the state of mind of the farmers or who, in spite of general opposition, have imposed schemes of compulsory insurance, have been forced to realize that it was impossible to operate them. The farmers have opposed compulsion by refusing to pay the premia, which, in crop insurance, are collected directly from the insured person and cannot be collected from the employer by deduction from wages, as is the case, for instance, in social insurance.

If the introduction of a compulsory insurance scheme seems nevertheless necessary, an attempt must be made to convince the farmers by explaining to them its advantages.

If the peasants are not ill-disposed towards a compulsory insurance scheme, or if their opposition has ceased, if, therefore, they are ready to accept compulsion, it may still happen that the manner of introducing the compulsory insurance arouses resistance. If this is to be avoided, compulsion must not be pushed too far. Moreover, compulsory insurance must offer the farmers considerable advantages which will place them in a better situation than the one in which they would have found themselves if they had not contracted the insurance or had taken out a voluntary policy. These advantages must not be only financial (for instance, fair and moderate premium rates, excellent security), but must also be of technical nature.

(A) *Organization.*

There are three factors which are of importance in the organization of compulsory crop insurance:

(1) *The insurers.* — If there exist already insurance organs who handle crop insurance, such as those for hail insurance, and if they are willing to undertake compulsory insurance, it should be entrusted to them. In this case, the underwriters must not necessarily be private insurance organizations, as is the case in the canton of Basel-Town and in Yugoslavia in 1923, and the business may be entrusted to public institutions (Poland, 1929; Bulgaria, 1942).

If there is no insurance already in existence or if the organs of voluntary insurance refuse to undertake the carrying-out of a compulsory insurance scheme, the Government must create a public institution (as, for instance, in the canton of Basel-Country, in North Dakota and in South Dakota). This is particularly the case of general crop insurance which no private underwriter has up to the present dared to undertake [1].

As we can see, apart from quite exceptional cases, compulsory crop insurance is not at the present time handled by private insurers, so that Government initiative predominates in this branch of activity.

(2) *Different types of compulsory crop insurance.* — Apart from the different combinations of crop insurance according to the risk insured (hail insurance, general crop insurance), and the various crops to which compulsory insurance can be extended, three types of compulsory crop insurance may be distinguished according to the principles on which their organization is based.

(*a*) General compulsory insurance which extends to the whole country and under the terms of which every farmer who grows a crop subject to insurance is compelled to insure (cantons of Vaud, Basel-Town and Basel-Country, U. S. S. R., Bulgaria).

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[1] Private insurance companies in the United States of America have also refused to undertake or even to participate in a general wheat insurance (see ROMMEL, *op. cit.*, pp. 33-34).

(*b*) The so-called " optional application of compulsory insurance ". This applias only to particular regions of a country, certain banats, voivodies or communes, the authorities of these administrative units remaining free to decide whether or not compulsory insurance is to be introduced.

The optional application of compulsory insurance has an advantage over compulsory general insurance in that it can be more satisfactorily adapted to the special conditions of production prevailing in a given region. Above all, where compulsory insurance is organized according to the separate communes an excessively schematic application of the measure is avoided and the drawbacks of compulsion are thus considerably mitigated. Whether and to what extent the optional application of compulsory insurance satisfies the general interest of the State in the insurance is another question which has to be considered on the merits of each particular case. Moreover, it must not be forgotten that in any case the optional application of compulsory insurance diminishes the possibility of special compensation of risks.

(*c*) Semi-compulsory or automatic insurance. In this form of organization personal concessions are made to the farmers. Every farmer is automatically insured, but he is entitled within a certain term and in a given form to present a declaration according to which he withdraws from the compulsory insurance scheme.

Automatic insurance exists in North and South Dakota and in parts of Canada; with certain restrictions it has also just been introduced in the Swiss canton of Nidwalde.

Experience with automatic insurance has so far been rather unsatisfactory, since, with the passage of time, the lighter risks have been withdrawn from compulsory insurance and the Government institutions gradually found themselves burdened with a one-sided combination of the heavier risks which merely made their position, already sufficiently difficult, still worse (See statistics concerning the operations of the North Dakota Insurance Institute).

Nevertheless it must not be forgotten that the dissatisfaction of the insured persons with the insurance scheme plays an important part in this withdrawal, whose proportions would have been smaller if the handling of compulsory insurance had been more satisfactory (fair premia, fixed compensation, etc.).

(3) *The compulsory underwriter's relation to competition.* — The ideal condition in insurance is free competition. Besides resulting in fair premium rates, it also leads to a gradual improvement in the insurance system.

So far, in general crop insurance there has been no question of competition between several underwriters, because private underwriters have not handled this branch of insurance up to the present time. In hail insurance, especially when the risks are grave, private competition is also sometimes absent as, for instance, in Bulgaria. In any case, the compulsory underwriter enjoys a real and positive monopoly.

In so far as in spite of this, private underwriters exist, as is the case in Dakota, Canada and in ex-Yugoslavia, the following instances may be distinguished:

(*a*) The compulsory underwriter enjoys a legal and absolute monopoly, other underwriters being excluded from activity not only in respect of the

compulsory insurance but even in respect of any possible optional insurance (U. S. S. R., cantons of Vaud and Basel-Town).

(*b*) The compulsory underwriter legally claims for himself a monopoly only in so far as it applies to the business within the limits covered by compulsory insurance, apart from this, he works in competition with the private companies. This may be the case in respect of supplementary optional insurance, as well as of the crops not subject to compulsory insurance, or even for both possibilities in a complementary compulsory insurance (*e. g.*, in the Danube Banat).

(*c*) The compulsory underwriter does not enjoy a monopoly, but works in free competition with the private companies (Save Banat). Automatic insurance also belongs to this category since, after having made use of his right to cancel the compulsory insurance with the insurance institute, the farmer is free to contract for voluntary insurance with a private company (North and South Dakota).

(B) *Natural risks.*

In the first place an attempt will be made to subject to compulsory insurance the principal risk in a country, the others being left in the hands of voluntary insurance.

This idea has been realized in compulsory hail insurance, but could not be applied to all risks. This is because, on the one hand, there are risks due to natural causes which do not lend themselves to special insurance, either because they only occur at long intervals, *e. g.*, drought in several of the United States of America, or because they are of a local character, such as floods depending on altitude, and do not therefore cause any damage whatsoever to some, while others suffer repeatedly.

In many countries, moreover, there are several principal risks, as in Japan, one threatening one crop in particular, another a different crop. If compulsory insurance is imposed for several selected risks, the work of the crop insurer is rendered very much more difficult, since in the case of selected risks each case of damage must be assessed separately (see letter D, No. 2).

Consequently, if several principal risks are found in a country or if there is only one principal risk which does not lend itself to a special insurance, it is wise to extend crop insurance to *all* the risks from natural causes (see Part II: Preliminary remarks) and in this way to cover those risks also which could not have been covered by a special insurance.

It is as a result of these considerations that the general crop insurance covering certain industrial crops in the U. S. S. R. has been instituted and that the Federal Crop Insurance Corporation in the United States grants an optional government insurance on wheat since 1939. General crop insurance, also called insurance against bad harvests, has the essential advantage that the assessment of damage may be made summarily (see letter D, No. 2) and that the calculation of compensation is also considerably facilitated (see letter F, No. 2 b). It also exercises a much more widespread attraction, since there is scarcely a single farmer who does not feel himself threatened by some risk from the elements.

(C) *Crops to be insured.*

Since compulsory insurance must never be extended beyond what general public interest demands, liability to insure must be confined to the principal crops in the country under consideration, namely, the crops whose cultivation and yield are of decisive importance for the population.

This is a requirement which has been borne in mind by a number of insurers who have undertaken compulsory insurance, *e. g.*, in Bulgaria, 1942 (cereals), in the canton of Vaud (vines and cereals), in the Save Banat (cereals and vines), in Alberta (cereals, flax), in Japan (rice, mulberry leaves, cereals).

On the other hand, restriction must not be pushed too far. If wheat is insured, for instance, as is done by the Crop Insurance Corporation, the insurance must not cover spring wheat or autumn wheat exclusively, because this kind of excessive specialization of the crops covered diminishes the degree of compensation of risks ([1]).

To include all the country's crops would involve disregard of the essential condition of compulsory insurance, namely, the existence of public interest, it would also make the operation of the scheme of compulsory insurance in respect of the assessment of premiums and loss, etc. much more difficult. On the other hand, some underwriters have carried the restriction of crops subject to insurance beyond the point necessary, as, for instance, in Dakota, Saskatchewan, the canton of Basel-Town and the U.S.S.R. In Bulgaria it was found impossible to maintain compulsory hail insurance as instituted in 1896, because it covered all crops except tobacco.

(D) *Damages.*

In insurance against one or more selected risks, the loss caused by these is insured against. In general crop insurance covering all risks from natural causes the insurance covers the yield of the crop. This gives rise to essential differences in the treatment of loss.

(1) *Notice of damage:*

(*a*) Underwriters who only insure against one or more selected risks are compelled to insist that notice of loss be given as soon as possible. They fix definite terms for notification.

(*b*) In general insurance of the yield of the crop, on the other hand, the underwriter may dispense with insisting upon the notification of particular damages and confine himself to requiring notification of the total yield of the various crops insured on the completion of the harvest.

(2) *Assessment of damages:*

(*a*) In insurance against damage to crops, the underwriter must assess the loss as soon as possible after he has been notified in order that the farmer may

([1]) See VALGREN, *op. cit.* English summary, p. 338.

continue to work and possibly put the ground into cultivation. In the case of compulsory insurance this is all the more urgent in that the compulsory underwriter must see that compulsion is felt as little as possible and, consequently, he must avoid any action which might cause the farmer discontent. Thus, delays in assessing damages in the case of hail insurance in the Primorsko-Krajisko Comitat have been one of the contributing causes of the opposition to compulsory insurance in agricultural circles in that part of Yugoslavia.

The assessment of damages is individual and is effected after each case of loss. The damage is assessed as follows: the probable yield which would have been obtained had the insured loss not occurred is first established (compensation value). The proportion in which this probable yield has been reduced by the insured loss is then established as a percentage. The damage is thus calculated as a percentage of the compensation value.

(*b*) In the case of general insurance of the yield of the crop the underwriter can dispense with the individual assessments of losses, since the loss of yield is in this case established summarily. It suffices to ascertain the final yield of the crop. The loss in yield suffered is calculated by subtracting the yield obtained from the insured yield. Only when the yield actually obtained is less than the insured yield does the question of a damage arise.

Since only damage caused to crops by the elements is insured, and since the risk of price fluctuations is excluded, the crop yield is determined by weight (in metric quintals for industrial crops in Russia) or in measures (bushels by the Crop Insurance Corporation). As the sum insured is also expressed in these units, the loss in yield is similarly established in weight or measures.

(E) *Insurance sum.*

In optional crop insurance and especially in hail insurance, the insured person as a rule himself fixes the amount to be insured on the basis of his own valuation of the crop. In compulsory crop insurance, on the other hand, it is the underwriter who establishes the insurance sum.

The amount to be compulsorily insured indicates, on the one hand, the minimum values to be insured and constitutes, on the other, the highest limit of liability to insure. Values in excess of the amount subject to compulsory insurance are not covered by it but may as a rule form the object of supplementary voluntary insurance. Such is the case in North Dakota (1921), U. S. S. R., the canton of Vaud and Bulgaria (1942).

There are two points which are important in connection with the amount to be compulsorily insured: the way in which the sum to be insured is calculated and its amount.

(1) *Determination of the amount to be compulsorily insured.* — The amount to be insured compulsorily is determined either schematically by unit of area and type of crop, or individually according to the yield of a given property. Most underwriters establish this amount for an indefinite period; in the U.S.S.R. and in the canton of Basel-Town this is done each year. In hail insurance, the insurance amount is expressed in the national currency; in general crop insur-

ance, covering losses on the yield of crops, one finds the insurance amounts expressed in weight (U. S. S. R.) or in units of volume (optional Crop Insurance in the United States).

(*a*) The schematic determination of the insurable amount per unit of area and type of crop is still the general rule. With very few exceptions this method is found in all compulsory crop insurance schemes.

The schematic insurable amount is the same for both good and bad soils, as well as for more or less intensive systems of farming. In this case account is not taken of the particular productivity of a holding, and is accordingly relatively higher for a farm with low productive capacity than for one of which the productive capacity is high.

(*b*) The insurable amount determined individually takes account of the particular productivity of each holding. Consequently, it is higher for productive holdings than for those whose productivity is not so great. In order to establish the degree of productivity, the yield of each individual holding is studied over a series of years and the average yearly yield is then calculated. This forms the basis for calculating the individual insurable amount.

The insurable amount is determined individually in the optional wheat insurance offered by the Federal Crop Insurance Corporation, where the cover is determined in bushels at the farmer's choice at 50 or 75 per cent. respectively of the average yield [1]. This method of determining the insurable amount may be recommended to every compulsory underwriter because, as opposed to what happens in the case of the amount insured by the schematic method, it is fair from every point of view.

(2) *Amount of the compulsory insurance sum.* — This amount depends upon the extent of public interest in the matter, which in itself is the essential condition of compulsory insurance. As a rule public interest will be limited to guaranteeing to the farmer his production costs, so that when the harvest is bad he may be able to continue operating his farm. Consequently:

(*a*) if the insurance sums are lower than the production costs the objects of compulsory insurance will not be attained completely. We will not attempt to decide whether the very low insurance sums under compulsory insurance in the U.S.S.R. succeed in covering production costs. In Great Russia, for instance, only about 50 roubles per hectare for cereals in the *Kolkhóz* and 4 metric quintals for cotton were insured in 1937. The insurance amounts under crop insurance are inadequate in Japan where, with a very few exceptions, only 20 *yens* are paid as cover for rice and mulberry leaves and 10 *yens* per *tan* for cereals. These amounts represent only between 20 and 30 per cent. of the crop's normal value. It is to be expected, however, that as insurance gradually develops, an increase will be registered in insurance sums.

(*b*) most compulsory insurance schemes cover production costs to a greater or lesser degree; this is the case in the following regions: Saskatchewan $ 5.00,

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(1) See ROMMEL, *op. cit.*, pp. 41-42.

North Dakota (1919) $ 7.00, South Dahota $ 10.00 per acre. In the canton of Vaud the insurance sum under the compulsory insurance scheme is 8 francs per *are* for breadmaking cereals, 6 francs for other cereals and 40 francs for vineyards. Under the new Government hail insurance in Bulgaria the compulsory insurance sum for cereals is 60 per cent. and for other crops 50 per cent. of the value of the yield as officially ascertained.

(*c*) the insurance sum under compulsory insurance schemes must not provide for covering the farmer's profit, the more so as compulsory crop insurance cannot be organized except at considerable financial sacrifice to the Government. The mass of the population cannot indeed be made to carry a burden for the benefit of agriculture beyond what is strictly necessary in the public interest. The insurance sums are particularly high in the canton of Basel-Town. For breadmaking cereals, for instance, it fluctuated in 1941 from 11 to 14.50 francs per *are* according to the variety of the cereal. These rates are only about 10 or 15 per cent. lower than the maximum values established by the Swiss hail insurance company.

But the limitation of the insurance sum to production costs is also important from the standpoint of the premium rates, because the latter is usually very high in crop insurance (see below, under G, No. 3).

(F) *Compensation.*

Compensation must be adequate; in other words, in the case of damage to or loss of insured yields, the insured person must be enabled to continue operating his farm. On the other hand, it is not at all necessary that compensation should be so high as to compensate the farmer for any profit he may have lost. This is especially true in the case of general crop insurance.

Compensation must correspond to the gravity of the damage or to the loss of insured yield. Not every insured damage, however, nor every loss of yield, is compensated. Both under voluntary and under compulsory insurance certain limits are set to compensation.

(1) *Compensation limits.* — In crop insurance the setting of certain limits to compensation is unavoidable. In insurance against damage to crops certain small losses which cannot be ascertained must be excluded from compensation. In insurance of crop yield the underwriter must not under any circumstances free the farmer from all risk due to natural causes, because an insurance of this kind would destroy all his interest in the results of the harvest. Compensation must also take account of insurance costs, this being particularly true in the case of compulsory insurance of the crop yield, where as a rule the risk is very high and where the premium increases progressively in relation to the increase in compensation.

The following observations may be made in connection with the limits of compensation:

(*a*) the highest limit of compensation consists of the insurance amount which plays a predominant part precisely in crop insurance. It is important

in all types of crop insurance, whether in the case of hail insurance or of general insurance of crop yield, whether the insurance is optional or compulsory and whether the insurer is a private concern or a public institution;

(*b*) compensation has often a lowest limit in the exemption margins. This excludes from compensation losses which, in practice, either cannot be ascertained at all or can only be ascertained very roughly. At the present such margins exist almost everywhere in hail insurance. They generally appear in the form of total exemption expressed as a percentage of yield. It takes also sporadically the form of deduction from the amount of compensation, as, for instance, in the Swiss soil and crop insurance, where a fixed margin is subtracted from all loss subject to compensation. General insurance on the crop yield may dispense with such exemption, since the insurance amount is low and does not in any case cover slight losses on yield.

(*c*) In crop insurance one also occasionally finds proportional participation in loss by the insured person, on the basis of which every insured person must bear a certain percentage of any loss incurred. This is the case with crop insurance in the various Swiss cantons. The adoption of such pro-rata participation of the insured in the losses has proved necessary since the insurance amount covers the full value of the holding.

(*d*) Nor is it rare to find extraordinary compensation limits fixed in crop insurance schemes in those cases where the insurer's means of cover might be inadequate. These limitations are not found in private mutual hail insurance alone, but also in government institutions: in Bulgaria (1896-1903) and in North Dakota (1911-1918).

In practice it is important to know whether the application of these compensation limits is more or less frequent. If compensation reductions are to be expected every year, as happened in the two cases mentioned above, these measures give rise to extremely strong opposition to compulsory insurance and in the end prove the ruin of this form of insurance. It is quite different when the importance of these reductions in compensation is theoretic rather than practical, as is the case in the cantonal hail insurance in force in the canton of Vaud.

In compulsory insurance of the crop yield which does not cover the minimum yields, any limitation of the compensation due to inadequacy of funds must absolutely be avoided. Such a limitation would, indeed, render illusory the very object of the insurance, which is that of providing the farmer with the necessary means for enabling him to continue the operation of his farm. Consequently, the compulsory scheme for the insurance of crop yields is obliged to provide the necessary guarantees of its ability to pay compensation in full even in cases where the loss assumes catastrophic proportions (see below under J).

(2) *Calculation of loss.* — Calculation of loss differs according to whether the insurance is against damage suffered by crops or against loss of crop yield.

(*a*) In insurance against damage to crops which covers certain selected risks due to natural causes, and consequently hail insurance in particular, compensation is calculated as a percentage of the insurance amount on the basis of the ascertained damage quota (see above under D, No. 2-*a*). In American

hail insurance the insurance sum forms the basis for calculation [1] even in the case of over-insurance, while in other countries, such as Switzerland, when over-insurance is ascertained, the real crop yield is used as the basis for calculating compensation.

In the proportional calculation of compensation, all loss is therefore compensated on principle. Only on the ground of exemption may slight damages be excluded from compensation, while the *pro rata* participation of the insured person in bearing the loss or an eventual reduction of compensation in case of the insufficiency of the insurer's funds only diminish the compensation.

(*b*) At the end of the harvest the underwriter for insurance of crop yield who covers all risks due to natural causes compares the yield obtained in measure or in weight with the yield represented by the insurance sum. Compensation is calculated by subtracting the real yield from the insured yield. No question of compensation arises unless, and to the extent that, the yield obtained is less than the insured yield. Since the insurance sum is usually very low and since this has the same effect as a deduction of a very high uncovered margin, a large number of small and medium losses of yield are not entitled to compensation. By adopting this method of calculating compensation the need for an uncovered margin is eliminated. No reduction in compensation is found, either in the case of inadequate funds nor in general compulsory insurance of crop yield in connection with industrial crops in the U. S. S. R., nor in optional insurance of the wheat yield in the United States of America.

The underwriter who handles general insurance of the yield of crops does not therefore in any way compensate all losses of yield, but only those where the yield obtained is lower than the insurance sum.

Summary compensation has some essential advantages over the *pro rata* method: the simplicity in calculating compensation, the principle of adapting compensation to the most urgent needs of the person who has suffered loss, exclusion of lost profit, absence of uncovered margin.

(3) *Mode of compensation.* — Compensation must be paid in money. This holds good, generally speaking, for underwriters who fix the insurance amount in money. But the general underwriter for insurance of crop yield who establishes the insurance amount in weight or measures and who also calculates compensation in these terms, must himself pay the farmer's compensation in money, if the latter asks him to do so and the weight or quantity of the product to be replaced may be calculated at their current value in money. This is done, for instance, in the American wheat insurance [2].

(4) *Time of the payment of compensation.* — Compensation must be paid as soon as possible, because, in most cases, the farmer is in urgent need. The insurer under a compulsory scheme, especially, must arrange for prompt compensation in order to please the holder of the compulsory insurance policy. Delay

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(1) See VALGREN, *op. cit.* English summary, p. 336.
(2) See ROMMEL, *op. cit.*, pp. 43-44.

in payment of compensation leads to discontent (Primorsko-Krajisko Comitat, Dakota, etc.). It appears advisable to fix the terms within which compensation must be paid, in order that the farmer may make his arrangements.

Reduction of compensation due to inadequacy of the insurer's funds not only represents an element of insecurity for the farmer, but also delays the payment of compensation, and consequently is disagreable from this point of view as well.

(G) *The premium.*

The premium is calculated on the insurance sum. The more practical and fair the manner of fixing the insurance sum, the better it will serve as a basis for calculating the premium.

The outstanding principle in calculating the premium in compulsory crop insurance should be the fair distribution of the premium. A fixed premium is preferable to a variable one. Moreover, a premium must be bearable for every farmer, even for those who are threatened by serious risks. Lastly, the collection of premia must as far as possible be adapted to agricultural conditions, and consequently it must take place at a time when the farmer is in possession of the necessary cash. Special mention should be made of the following points.

(1) *Uniform premium or individual premium:*

The compulsory insurer who authoritatively fixes a premium can in no wise do so according to his own judgment. Although compulsory insurers did formerly imagin that they could further their own interests with a uniform premium or one graduated according to a sliding scale, they were taught to do better by the opposition encountered in practice by premium rates fixed on this principle (North Dakota).

Even more than in other cases, the premium rates in compulsory insurance must be perfectly fair, because the farmer is compelled to pay the premium and cannot, as in voluntary insurance, decide of his own free will whether he wishes to contract an insurance or prefers to give it up.

Nevertheless, even to-day we find in compulsory insurance both the uniform premium and the individual premium.

(*a*) The uniform premium. This is convenient for the underwriter and simplifies the management of his business. It is based either on land register assessment or is fixed per unit of area.

(*aa*) Land register premium. This type of premium is particularly unfair, because the properties whose value is great have to pay a higher premium per unit of area, but the greater value of such a property does not consist only in the quality of the soil but also in the smaller degree of risks due to natural causes. On the other hand, the premium is relatively low for cheaper properties which have been fairly assessed at such a low value because they are severely threatened by damages due to natural causes.

A premium based on land register values was in force in Bulgaria in 1896. It provided one of the reasons why farmers would have nothing to do with insurance, the unfair distribution of burdens being one of the objections to it.

Experience in Serbia in 1905 with a land register premium was equally unsatisfactory. Even to-day there still exists a land register premium in crop and soil insurance in Switzerland. If it has not given rise to complaint this is perhaps due to the fact that it is very low, being only from 0.10 to 0.20 per cent., but another reason is that in Switzerland the spirit of solidarity is very highly developed and everywhere those who are threatened with slighter risks see no objection to helping those who are more severely threatened to carry the weight of their insurance.

(*bb*) Area premium. This premium is based on the area of the property. It is collected either on all the land entered on the land register as cultivated with a given crop, without taking into account whether it is actually cultivated or not, or else only on the cultivated area.

The collecting of area premium on uncultivated land is usually considered as being unfair, especially in countries where large tracts of land have not as yet been cultivated. This was the case, for instance, in the former Primorsko-Krajisko Comitat in Yugoslavia, where in 1930 12 per cent. of the land was still uncultivated.

But even the area premium applied exclusively to cultivated land is not fair, either, because it takes no account of the type of crop nor of the local risk.

Attempts have been made to reduce the disadvantages of the area premium by adopting a sliding scale of risk zones (as in South Dakota in 1919 and North Dakota in 1925).

(*b*) Individual premium. This premium is fixed according to the type of crop and to local risk. It is the only fair method of calculating the premium. If even the optional insurer cannot do business to-day without an individual premium, there is all the more reason why this method should be adopted in compulsory insurance.

There are two different degrees of individual premia. In the first degree the individual premium is calculated exclusively on the basis of the type of crop, while no account is taken of local risk. But a real individual premium is one calculated not according to the type of crop only, but based simultaneously on the local risk.

(*aa*) The premium calculated according to the type of crop is found in the U.S.S.R. and the canton of Vaud. In the U.S.S.R., however, the premium is fixed for each republic separately according to its particular conditions of production. In the canton of Vaud, on the other hand, the cantonal institute has given up, once and for all, the consideration of local risk because of the very small area to which the insurance applies.

(*bb*) The real individual premium is found in Japan where it is calculated on the basis of detailed statistics concerning losses in which the risk is declared for each commune according to the type of crop and the threatened damage. In Bulgaria, too (1942), the premium is calculated according to types of crop and local risk.

(2) *Variable as against fixed premium:*

(*a*) The variable premium enables the underwriter to hold the necessary funds in readiness for meeting demands for cover even when the request involves

a large figure. This is why the variable premium is often found in private hail insurance. It is collected either in such a way that when funds are inadequate to cover the risk, the underwriter reserves for himself the possibility of collecting supplementary premia (the Swiss Hail Insurance Company, for instance), or else so that the total annual losses are distributed at the end of each year among all the farmers in relation to the values insured.

The variable premium is also found in compulsory insurance; the South Dakota scheme, for instance, provides for the collection of supplementary premia, while in North Dakota and the province of Alberta, the premium is fixed on the basis of losses incurred.

Although the variable premium appears practical for the underwriter, it is very inconvenient for the insured person, since it burdens him with a large part of the risk and prevents him from preparing a fixed budget. Consequently, it cannot be recommended for compulsory crop insurance.

(*b*) The fixed premium imposes upon the insured person an outlay which he knows in advance, the risk of variations in losses weighing entirely on the underwriter. The latter can therefore only work on the basis of a fixed premium if the amount of annual losses is not too large or if he can count on adequate reserves or reinsurance enabling him to supplement his annual revenues if the losses become too many or too heavy.

As compulsory insurance is based on official decisions and is often applied by a public institution founded by the Government, this institution must be placed on a financial basis which enables it to work with a fixed premium and thus lighten as far as possible for the insured person the burden of compulsory insurance. This has already been realized in the U. S. S. R.

(3) *The premia in relation to the paying capacity of the insured:*

The premium paid in crop insurance is, as a rule, fairly high. This is the case even in hail insurance, but it is still more so in general insurance of the crop yield which covers all risks due to natural causes.

The premium must be sufficiently high to cover the insured risk. On the other hand, it must not be so high as to exceed the paying capacity of the insured person. Above all, this must be avoided in compulsory insurance which groups all farmers together, those who are financially weak as well as those who run especially serious risks due to natural causes.

Consequently, the premium must be kept as low as possible. This end is obtained by limitation of the insurance amount (see under E, No. 2) as well as by a possible limitation of compensation (see under F, No. 1). But these two measures cannot be pressed indefinitely, without compromising the objects aimed at by compulsory insurance.

If in spite of this the premium required by the underwriter exceeds the farmers' capacity to pay, the State must contribute financially towards the premia (see under H) and thus reduce the burden of the insured.

In compulsory crop insurance it often happens that the insured person does not pay the whole premium, but only a part. This is the case in the cantons of Vaud and Basel-Town, and in Bulgaria (1942), while in the Swiss crop

and soil insurance the State contributes in large measure towards the premia paid by the insured.

(4) *Collection of premia:*

The underwriter in voluntary crop insurance usually collects the premium before the insurance comes into effect. If it is not paid either the insurance does not come into effect or else compensation is refused.

In compulsory insurance the underwriter who acts in the public interest, cannot make his liability to cover losses dependent upon the payment of the premium in advance. He therefore does not need to insist upon such payment.

It is therefore practical to arrange for payment of the premium at a time when the farmer has funds available, namely, during the period following the harvest. The premium may also be paid by postdated cheque payable after the harvest.

The funds required by the compulsory underwriter until he has collected the premia are generally advanced by the Government or by a bank (*e. g.*, in Alberta, North Dakota).

The underwriters in certain compulsory insurance schemes who collected the premia in the spring have often had to register failures, and this even in the case of those insured who were otherwise ready to pay. It is therefore advisable to arrange for collection of premiums during the period after harvest. In Alberta (Canada), the premium may be paid up till December 15. In the canton of Vaud insurance instalments have to be paid together with the taxes on December 31. In the U.S.S.R. the collection of premia is effected in two or three instalmente, the earliest being on September 15. In the Save banat (Yugoslavia), the premium has to be paid during September. As the financial year of this institution begins on September 1st, this really constitutes a premium paid in advance.

(H) *Government contributions.*

Financial contributions by the governments cannot be justified except on the ground of vital public interest attaching to an insurance; this is an essential condition of every form of subsidy given under a compulsory insurance scheme or under voluntary insurance.

(1) *Need for government subsidies.* — If a compulsory insurance scheme is to function better than does voluntary insurance, the Government must be prepared to make financial sacrificies. These subsidies afford the most effective expedient for making compulsory insurance acceptable to the insured persons. Wherever the Government has not decided to grant subsidies, compulsory crop insurance has not been successful.

State aid is all the more necessary in crop insurance because this form of insurance often involves severe risks and the premia are consequently also very high. The type of insurance where government subsidies seem to be most necessary is the compulsory general crop insurance which covers the crop against all risks due to natural causes.

(2) *The various forms of financial contribution by the State.* — The State may make its financial contributions in various ways:

(*a*) by making a single large appropriation for the working capital of the insurance institution, as was done in Bulgaria in 1942 (200 million levas), in the canton of Vaud (one million francs) and in the canton of Basel-Town (300,000 francs);

(*b*) by making an annual contribution of lump sums for management expenses: Bulgaria 1896: 500,000 levas, North Dakota 1919: 100,000 dollars.

(*c*) by contributing a percentage towards the premia, *e. g.*, Bulgaria 1942: 60 per cent., Basel-Town 50 per cent., Bâle-Country 50 per cent., Vaud 33 per cent. for vineyards and 20 per cent for cereals. These contributions of a percentage of the premia appear in several respects to be more practical than annual lump sums for the following reasons:

(*aa*) Contributions to premia adapt themselves directly to the volume of the transactions.

(*bb*) Contributions to premia make it possible to grant higher subsidies for heavier risks. In regions more severely threatened by hail the Swiss Confederation grants a higher rate of subsidies to hail insurance. In the canton of Vaud the subsidies paid to compulsory hail insurance for vines especially liable to damage by hail are higher than those paid for compulsory cereal insurance.

(*cc*) The granting of a government contribution towards the premium makes it possible, in cases where the compulsory underwriter deals in voluntary insurance as well, to make a distinction between compulsory insurance, on the one hand, and voluntary insurance, on the other. This can be done in such a way that compulsory insurance receives larger subsidies than voluntary insurance, or else so that the latter receives no subsidy at all. In the canton of Vaud subsidies to the supplementary voluntary insurance, which formerly existed, were abandoned in 1936; according to the law promulgated in 1942 only compulsory insurance is subsidized.

The different forms of subsidy are often combined, as in the cantons of Vaud and Basel-Country and in Bulgaria (1942).

(J) *Guarantees.*

If the compulsory insurer has to try to make insurance work as smoothly and as surely as possible for the farmer, be must also, as stated above, avoid as far as possible making the insured person bear the weight of supplementary premia or reduced compensation in years of heavy loss. But the underwriter can only meet this requirement if he has adequate financial guarantees at his disposal, such as reserves, reinsurance and State guarantees.

(1) *Reserves.* — All underwriters accumulate reserves. The more variable the risk insured, the more necessary the reserves are. Since the risk due to natural causes run by the crops fluctuates considerably, the reserves must be ample in order to offer satisfactory financial backing in the case of crop losses on a catastrophic scale.

Underwriters usually form reserves by means of unused premia. But in crop insurance, which in itself already demands high premium rates, it is impossible, except to a very limited extent, to collect supplementary premia for the formation of reserves (1). In order to accumulate reserves the underwriter must therefore also count upon government assistance. In so far as public interest in the insurance exists, this assistance will not be refused. State aid takes various forms, as described above under letter H, No. 2: contribution of a large sum to the working capital when the insurance scheme begins operating, annual contributions of lump sums towards insurance expenses. The payment of large subsidies on insurance premia may also contribute towards the formation of reserves.

There is, however, a limit to the formation of reserves as they can only be formed with the underwriter's surplus receipts and with government subsidies granted for this purpose. Account must also be taken of the difficulties sometimes encountered in investing very large amounts of reserve capital.

For these reasons the reserves at the disposal of a crop insurer are rarely sufficient to allow him, in years of very heavy loss, and especially if such seasons follow one another in close succession, to meet his obligations in full. This is why it is necessary to have recourse to supplementary guarantees.

(2) *Reinsurance*. — The very complicated risks covered by crop insurance invest reinsurance with a special importance. Only the *Gosstrach* in Russia has been able up to the present time to renounce voluntarily reinsurance.

By means of reinsurance and the retrocession which follows, the risk is distributed on various shoulders, and even foreign countries are called upon to share it. When contracting reinsurance, it seems advantageous to insure not only a quota but also, if possible, a surplus.

Unfortunately, the reinsurance market for crop insurance is still very restricted, because reinsurance involves heavy financial risks which the private reinsurance organizations, who work on the profit-earning principle, are not as a rule willing to run. So far, therefore, private reinsurance is found for hail insurance only. In this case, too, reinsurance may suffer very heavy loss, as has been proved by the experience of the cantonal hail insurance institution in the canton of Vaud which had reinsured with Lloyds of London. The surplus originally covered, for which the reinsurance had fixed a maximum as a precaution, gave rise to heavy losses. This led later to a revision of the contract, to a reinsurance combined by quotas and surpluses with a premium which had been considerably increased (2). The Swiss hail insurance company at Zürich has a combined reinsurance of quotas and surpluses since 1928 which has been consented to for considerations of a national nature by several large private companies in Switzerland.

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(1) In North Dakota a tax was collected on area, amounting at first to 3 cents and later to one cent per acre, to be used for the formation of a reserve fund. This tax on area represents a sort of minimum special agricultural tax for financing compulsory insurance.

(2) *Bericht der Kantonalen Hagelsversicherungsanstalt*, 1938, p. 6.

As far as can be ascertained, no private reinsurer has as yet been found who is disposed to cover a combined or general crop insurance. Here the State must come to the assistance of the underwriters. This has been done very skilfully in Japanese crop insurance, where the district agricultural insurance associations reinsure a 70 per cent. quota, while the Government accepts a specified surplus in retrocession from these associations.

(3) *State guarantees.* — If it is impossible to obtain private reinsurance and if the Government itself does not wish to give it either, the Government must give the underwriter guarantees enabling him in case of need to meet his engagements under the compulsory insurance scheme.

There is a State guarantee in the canton of Vaud amounting to 5 million francs. Similar guarantees are also found in voluntary insurance. The Crop Insurance Corporation in Washington, which is a State institution, holds a government guarantee of 100 million dollars.

V. Summary.

To sum up the above, the following observations may be made concerning compulsory insurance:

(*A*) Compulsory insurance is not an end in itself but only a means for attaining an end of interest to the State.

(*B*) Compulsory insurance depends on certain essential conditions of a general order: public interest; the generally widespread nature of the risk insured against; the lack on voluntary insurance facilities or the failure of the existing voluntary insurance to meet the requirements.

(*C*) Compulsory insurance replaces with compulsion the free decision of the citizen; this fact constitutes a drawback of the system. Consequently compulsory insurance must not be extended beyond the limits imposed by vital public interest. This is especially true for the types of crops to be insured (only the chief crops of a country should be insured), as well as for the insurance amount.

(*D*) Since the liability to insure always makes an unpleasant impression, and under it even small inconveniences assume disagreeable proportions, the compulsory underwriter has to do his best to make the insured feel compulsion as little as possible; he must also be accomodating and work harder than he would under voluntary insurance. The compulsory underwriter must therefore be as accomodating as possible in financial matters, in connection with the premium rates and the guarantee, as well as in all that concerns the technical aspects of his business, such as collection of premia, assessment of loss and compensation.

(*E*) In order to place the persons insured under a compulsory insurance scheme in a privileged position, the State must make considerable financial sacrifices, which nevertheless appear to be justified given the public interest attaching to the insurance.

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(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice monthly); bimestr. (every two months); déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular); mens. (monthly); n° (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

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AGRICULTURAL STATISTICS

MONTHLY CROP REPORT
AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country: Germany, Bohemia and Moravia (Protectorate); Hungary: 1 = *excellent,* 2 = *good,* 3 = *average,* 4 = *poor,* 5 = *very poor; Finland:* 8 = *very good,* 6 = *above the average,* 5 = *average; France:* 100 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *average,* 30 = *poor; Romania and Sweden:* 5 = *excellent,* 4 = *good,* 3 = *average,* 2 = *poor,* 1 = *very poor; Netherlands:* 90 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *below awerage; Portugal:* 100 = *excellent,* 80 = *good,* 60 = *average,* 40 = *poor,* 20 = *very poor; Switzerland:* 100 = *excellent,* 90 = *very good,* 75 = *good,* 60 = *fairly good,* 50 = *average,* 40 = *rather poor,* 30 = *poor,* 10 = *very poor; U. S. S. R.:* 5 = *good,* 4 = *above the average,* 3 = *average,* 2 = *below average,* 1 = *poor; Canada:* 100 = *crop condition promising a yield equivalent to the average yield of a long series of years; United States:* 100 = *crop condition which promises a normal yield; Egypt:* 100 = *crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed:* 100 = *crop condition which promises a yield equal to the average of the last ten years.*

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

VEGETAL PRODUCTION

THE RESULTS OF THE WORLD WHEAT CROP IN 1941 AND THE WHEAT MARKET SITUATION IN 1941-42

by G. Capone.

In the countries of the southern hemisphere, wheat harvesting is about over, thus completing the 1941 world harvesting crop cycle. In normal circumstances the Institute, at this time of the year, was in a condition to present an exact and nearly complete survey of crop results. But now, owing to the inevitable gaps in the information services and to the interruption of postal and telegraphic communications with many countries, a complete and precise estimate for most of the continents is out of the question. We must therefore limit ourselves to draw some conclusions as nearly exact as may be drawn from the rather vague and uncomplete material available at this time. This material is sufficiently complete, however, to allow a general outlook on the supplies of over-producing continents and on the wheat requirements of the continents that must normally recur to imports in order to fill their deficits.

Europe. — Wheat Production in 1941.

Great efforts have been made in all the European countries to increase the wheat area, with a view to insure, as much as possible with home resources, the food supplies of the populations, by making up at least in part, with an increased production the lack of importations caused by the blockade. In spite

of the scarcity of labour hands for working the land and the insufficient number of draft animals, fertilizers and carburants, autumn sowings were done, in most of the countries, on a larger scale than usual, thanks to the measures taken by the different governments in order to insure an increase in agricultural production. Leaves were granted to farmers who had been recalled to the colours, women, students, and in some cases even war prisoners were put to work. The propaganda on the best methods of cultivation was intensified, especially as regards the use of selected seeds. Prices paid to wheat producers have been considerably increased.

Weather conditions, quite favourable to sowings at the beginning of autumn, were not so much so later, especially in some important regions of central and eastern Europe where sowings had been delayed on account of retards in the gathering in of potatoes, sugar beets, and maize. Excessive rains in the last part of autumn seriously hindered, in these zones, the sowings program, and a considerable part of the area destined to the cultivation of winter wheat could not be seeded and had to be reserved to sowings of spring wheat. But even the latter could not be accomplished according to the intentions, as winter was abnormally long, bad weather, rain, snowfalls and heavy frosts alternated up to the end of April and even during the month of May, so that in many places the fields that had been destined to wheat, ended by being sown to other cereals or to leguminous plants. The forecast that the total wheat area for the whole of the Europen countries would by far exceed 79 million acres (which was the maximum registered in 1935) was not verified. There are no sufficiently complete elements to allow an exact estimate of the area sown to wheat in Europe in 1941, but we are justified in believing that it was considerably below the total forecast, and that probably it was not over 76 million acres.

All the vegetative cycle of wheat in 1940-41 was characterised, in Europe, by marked alternating influences of the weather, some favourable and some unfavourable. The beginning of autumn was generally helpful to a good germination, especially where sowings had been done early. But the plants suffered severely afterwards, particularly in the heavy soils of the plains, owing to excessive rains, and sometimes also to floods. Winter was long and severe, without however being as damaging as that of the year before. The temperature kept at an abnormally low level, cold was intense, but the abundant snowfalls in the central and southern zones of the continent protected the fields, and the losses due to frosts were less severe than the winter before, and, on the whole, they were not important. In the northern zones, on the contrary, it rained little.

During most of the spring, the weather was extremely variable; warmish periods alternated with repeated returns of rigid cold. It rained abundantly, and often even excessively, in the central and southern zones, causing again new floods which were especially damaging in the Danubian plains, while in the north a long and persistent drought prevailed. Fine weather and a gradual steady rise of the temperature started only in the month of June, causing a quick improvement in the conditions of the crops which were very late as a result of the adverse weather in the spring. Thus the last phase of ripening and

harvesting in the southern regions took place in good and even excellent conditions, also owing to the fact that the dangerous days of heat and drying southern winds, which often do so much damage in the mediterranean regions, were completely lacking this year. In these regions, production on the whole was about average. In the central regions, on the contrary, and in the Danubian countries, the last phase of ripening and harvesting was hindered by bad weather and rain during the second part of July and even in August. Wind storms and hail did considerable damage to the wheat crop. It must be mentioned also that since spring, war operations spread over vast zones of the eastern part of Europe, and further direct and indirect damages were registered in some regions which are very important from the point of view of wheat production. Consequently in the central and south-eastern section of Europe as a whole, wheat production did not fully reach the average, and in many countries it was considerably below it.

In the farther northern zones, where ripening is late, the beginning of summer was characterised by abundant rains which fell after the long spring drought. But they came too late to cause a substantial improvement in the condition of the crops whose production was mediocre and in some cases neatly bad.

On the whole, wheat production in the old continent, which in July still appeared as a good average one, although in our bulletin of the month of July it was forecast at about 1,580 millioni bushels (for Europe within the frontiers of 1938 and not including the U. S. S. R.) it later resulted less favourable. According to our latest estimates, it may be hardly above 1,470 million bushels.

Europe (not including the U. S. S. R.). — Wheat area, production, and yield per acre.

Periods	Area — million acres	Production — million bushels	Yield — bushels per acre
Average 1924-28	70.2	1,275	18.2
» 1929-33	74.6	1,497	20.1
» 1934-38	77.3	1,595	20.6
Year 1939	77.3	1,709	22.1
» 1940 (estimated)	74.1	1,323	18.0
» 1941 (estimated)	76.0	1,470	19.0

Until now, very few official estimates on production obtained in the different countries have been published (see Table, page 15) Italy, with a yield of 263 million bushels has registered a satisfactory production, which is very near up to the good average of the years 1934-1938 (267 millions). France, according to press information, has reached a production which is about the same as that registered by Italy, which means a much better production than the bad one of 1940, estimated at only 190 million bushels, but still about 10 per cent. lower than the average of the years 1934-38. The production obtained by Spain is over one third higher than the weak one of 1940, but it remains very much below the average of pre-civil war times. Production in Portugal, on the contrary, was abundant. In the United Kingdom, the wheat unit yield

the whole of the territories occupied by the enemy and those that have remained under the control of the Soviet government. If this be true, this Government will be faced with the big problem of how to provide for the victualling of the Union. Territories which yielded nearly one fourth of the whole wheat production and one fifth of the whole production of rye, are now in the hands of the enemy; a heavy proportion of the population of these territories has fled into the interior of the country, thus increasing the number of the people that must be fed; resources are poor, because it is doubtful if the country holds large surplus stocks of old wheat, especially after part of them, stored in the invaded territory, were destroyed or abandoned; needs are increasing, especially as regards army requirements; the importation of wheat from abroad on a sufficiently abundant scale, seems out of the question, owing to the length and risks of sea routes, the state of roads in the interior and the dearth of tonnage. All in all, it seems reasonable to believe that a particularly distressing situation prevails in the Union as regards consumption. According to some information, the preoccupations of responsible authorities extend equally over the next season, to the point that they seem to contemplate a strong reduction of cotton plantations in Turkestan in order to increase the area to wheat in the coming spring.

North America. — Wheat Production in 1941.

The pressure of old heavy wheat surplus stocks stored both in Canada and in the United States, the poor chances of exports and the action of the two governments contributed, in 1941, to maintain at a very low level the wheat sowings in the two countries. In Canada, according to the program announced by the government, farmers reduced the area sown to wheat by about 22 per cent. as compared with last year. In the United States the total area sown to winter and spring wheat in 1941 appears one of the lowest in the last twenty years, although it was 2 per cent. above the area sown in 1940. However, owing to the fact that damages done by winterkilling and by the spring drought in 1941 were of little account, the area harvested in the United States was considerably larger than that of 1940 and very near average.

In Canada, vegetation at the start took place in good conditions. Good reserves of humidity in the sub-soil over most of the Prairie provinces and intermittent rains in April and May had caused a vigorous development of the plants, so that the crop condition at the beginning of June was even better than at the corresponding date the year before. But the warm and dry weather that began at the middle of June and continued all over July in the two important provinces of Saskatchewan and Alberta, was very bad for the crops, and harvest forecasts were greatly reduced. Production estimated at 303 million bushels is quite below the excellent one of 1940 (551 millions) and slightly below the average of the five preceding years.

In the United States, on the contrary, both winter and spring crops were favoured by extremely good weather. Sowings and germination started in autumn in very favourable conditions, losses due to winter frosts were negli-

gible, and in the spring, rains were frequent and abundant. The only complaints of some importance were caused by excessive rains in the month of May-June over the great plains. These rains did some damage to winter crops, but at the same time they helped the growth of spring wheat sowings. According to the latest estimate, production amounted to 946 million bushels, which is one of the highest outturns registered in the United States after the 1915 record (1,009 million bushels).

Thus, in spite of the mediocre result of the Canadian harvest, the 1941 production in North America (including the other less important producing countries of the central part of the continent) appears to have been quite abundant.

North and Central America. — Wheat area, production and yield per acre.

Periods	Area sown — million acres	Area cropped — million acres	Production — million bushels	Yield — bushels per acre cropped
Average 1924-28	87.7	80.1	1,262	15.8
» 1929-33	94.6	85.7	1,161	13.6
» 1934-38	99.8	82.0	997	12.2
Year 1939	92.4	82.3	1,291	15.7
» 1940	93.2	84.1	1,385	16.4
» 1941	87.7	81.0	1,280	15.8

It is thus the fourth successive year that North America registers a wheat production decidedly above average. The tendency to a decrease of area sown to wheat could in part only compensate the influence of favourable weather conditions: since 1938, for several years in succession unit yields have been among the highest in the last twenty years. This succession of favourable years, in a period when international demand was quite limited, has caused the steady accumulation of stocks of old wheat in both overproducing countries. It is calculated that at the time of harvesting in 1941, surplus stocks in Canadian and American storehouses amounted to 835 million bushels, while three years before, in 1938, the amount was about normal: 175 millions. In order to fully evaluate the importance of this mass of wheat, one has only to think that world export demand in the five years that preceded the present conflict oscillated from a minimum of 500 to a maximum of 620 million bushels. Therefore, surplus stocks accumulated in North America alone would be amply sufficient to meet the normal demand of all the world importing countries put together, for over 18 months. There is absolutely no chance that this surplus may diminish during the present year. Even by admitting that home consumption in the two countries may continue to be as high as it was during last year, and that only a slight decrease of exports may be caused by the entrance of the United States in to the war and the extension of the conflict to the Pacific Ocean, the balance of the new North American harvest, which goes to increase the surplus stocks already existing at the beginning of the season, can be estimated at not less than 220 million bushels.

In other words, the surplus stocks that the two North American countries will register at August 1, 1942, will amount to 1,050 million bushels in round

figures. This enormous amount would suffice by itself alone to completely cover all wheat needs of the two countries for the whole year 1942-43 without any necessity for them to cultivate to wheat one single acre of land. It would besides leave a surplus equal to world import demand during half a season of normal proportions. In August 1941 the distribution of stocks in the two countries was about the same, with a slight prevalence of Canadian wheat. In August 1942, the distribution will be equally balanced, but with a prevalence of United States wheat.

Africa. — Wheat Production in 1941.

Wheat has a secondary importance in the black continent, where it is cultivated only along the mediterranean litoral and in the regions of the extreme south. Egypt and the South African Union generally register a production which is sufficient for their needs; while the three countries of French North Africa produce more wheat than is needed for their own consumption and which is exported to France. In the northern part of the continent, the course of the season in 1941 has been exactly the opposite of what it had been the year before. In 1940, weather conditions were much more favourable in the eastern than in the western regions. In 1941, on the contrary, weather conditions in Egypt were unfavourable and the production was 10 per cent below average. Conditions in Algeria, Tunisia and especially in Morocco, were better, and the outturn in these three countries, taken all together, was above average. Production in the Union of South Africa seems to have been only slightly different from last year.

Africa. — Wheat area, production and yield per acre.

Periods	Area — million acres	Production — million bushels	Yield — bushels per acre
Average 1924-28	10.4	108	10.4
» 1929-33	11.9	129	10,8
» 1934-38	13.1	136	10.4
Year 1939	13.6	168	12.4
» 1940	12.4	131	10.6
» 1941 (estimated)	...	147	...

By this estimate, wheat production in 1941 appears abundant enough, it being considerably above the averages of preceding years. The French part of North Africa has obtained this year an exportable surplus that is notably greater than that of the year before. This surplus might easily be absorbed by the mother country, which is an easy outlet for it; because even though French wheat production in 1941 was better than in 1940, France needs to complete her supply by wheat imports from abroad. Egypt finds itself in a distressing situation. Production was meagre and needs have increased on account of the concentration of a large army on its soil. The Union of South Africa seems not to need any supplementary importation, and can meet its home wheat requirements by its own production.

Asia. — Wheat Production in 1941.

The Asiatic continent, taken as a whole, may be considered as practically able to meet its own wheat needs by its own production. It is only the Far East that must normally import more or less important quantities of wheat in order to fill its own supply, while the Near East and India can quite often dispose of small surpluses for exportation. Wheat production in Asia, excluding China, has made considerable progress during recent years, especially in Japan, Syria, Turkey and India. In the year 1940 a maximum production was obtained, due especially to very abundant crops in India and Japan. In 1941, both in India and Japan there was a considerable decrease in the unit yields on account of the unfavourable course of the weather. Total production was markedly lower than in 1940, though it remained considerably above preceding averages. Turkey also did not obtain an abundant crop. Her production was lower than in 1940, but it still remained considerably above average. The other near-eastern countries, especially Syria, registered a good production. In Manchukuo, results this year were better than the altogether low ones of the year before.

As regards China, which is accounted among the world greatest wheat producing countries, it seems that production in 1941 was somewhat higher than that of 1940 and preceding averages. According to unofficial information, which however can be considered only as roughly approximate, production in 1941 amounted to 720 million bushels against 700 millions in 1940 and 710 millions as an average in the five preceding years. Total production for the whole continent excluding China, may be estimated at about 660 million bushels, i. e., 6 per cent. below that of 1940, but 9 per cent. above the average of the five years 1934-38.

Asia (not including China). — Wheat area, production and yield per acre.

Periods	Area — million acres	Production — million bushels	Yield — bushels per acre
Average 1924-28	43.0	478	11.1
» 1929-33	47.7	553	11.6
» 1934-38	50.6	610	12.0
Year 1939	53.6	667	12.4
» 1940	51.4	702	13.7
» 1941 (estimated)	...	660	...

If we examine the wheat supplies situation in the different regions of Asia, we may see that three groups of countries this year show plainly different characteristics in regard to their wheat resources: the Near-East, India and the countries of the Far East. The first group shows a modest small surplus available for export, which, during this year, may find an easy outlet in Egypt and, for small quantities, presumably also in Greece. India, in spite of a moderate harvest, in 1941, can dispose of large supplies from the 1940 production which will amply provide for its own needs. But it is quite unprobable that exports from India may amount to much, unless home produced wheat is going to be used to supply

British troops sent abroad for war service. The Far East was generally a good buyer of wheat from abroad, especially from Australia. During the last years however, for various reasons, wheat demand from the Far East had considerably decreased. The spreading of war activities over the Pacific has now definitely put a stop to any such demand. The wheat needs of Far Eastern countries will have to be covered by home production or substituted by other food cereals (rice, maize, millet, etc.) which they produce in large quantities. It is therefore to be foreseen that the Asiatic importing countries which in late years imported almost 50 million bushels yearly, will now cease to represent an outlet for the great overseas overproducing countries.

South America. — Wheat Production in 1941-42.

Although wheat is grown in nearly all South American states, its production reaches important proportions only in the agricultural economy of some of them (Chile, Uruguay and especially Argentina), while in most of the other countries (Brazil, Bolivia, Equador, Peru, Venezuela, etc.) it only occupies an altogether secondary position. Among them, Argentina, followed at a great distance by Uruguay, stands out as one of the great wheat overproducing centers. The others, either they produce enough wheat for their own needs, like Chile, or they import, chiefly from Argentina, the necessary amounts to complete their supply. But, all these countries, excepting Brazil, are very modest importers of this product.

It is evident that production in South America is almost entirely dominated by the result of the Argentine crops, which in fact account for over three fourths of the total. Argentine production is very irregular from year to year, not so much owing to the variations of areas sown to wheat every year, as owing to often quite considerable differences in unit yields, as results of the favourable or unfavourable course of the season. In the last four years, the following yields in bushel per acre were successively registered: 10.7, 18.1, 6.7, 15.5. On the whole, the weather this year had been favourable to an abundant crop, and this the more so as the area sown to wheat was the same as last year; but severe frosts in the month of October did such heavy damage to wheat fields that, according to the latest estimate published by the Government of Buenos Aires, production amounts to only 228 million bushels i. e., 44 million or 16 per cent. below last year.

South America. — Wheat area, production and yield per acre.

Periods	Area — million acres	Production — million bushels	Yield — bushels per acre
Average 1924-25/1928-29	22.2	297	13.4
» 1929-30/1933-34	21,3	280	13.1
» 1934-35/1938-39	20,5	290	14.1
Year 1939-40	17,1	173	10,1
» 1940-41	19,0	321	16.9
» 1941-42 (estimated)	...	280	...

Yields in the other wheat producing countries taken as a whole are nearly average. It may then be concluded that the total production of the South American continent may be estimated at about 280 million bushels i. e., 40 millions less than last year and only 7 millions over the average of the five preceding years.

Argentine production, although its amount is only moderate, has created serious preoccupations in responsible quarters, regarding the ways it can be disposed of. Home consumption can absorb less than half the quantity produced this year. The other part must either be exported or stored in the hope that a less unfavorable international situation may make it possible to dispose of it. But in 1941 Argentina could export only a part of her available surpluses, so that, on the eve of the new 1941-42 harvest she had already a large stock of unsold wheat, stored in the country's storehouses, amounting to nearly 110 million bushels. What export chances there are for such high surplus wheat supplies? The great markets open to Argentine wheat in normal times were in Europe (British Isles and continent), South America (Brazil and other nearby countries). The Far-Eastern countries imported wheat from Argentina ouly very seldom. The European continent, closed almost entirely by the blockade, can offer only some occasional chances of modest exports to non belligerent countries, especially Spain; but even those chances are subordinated to the amount of available tonnage and to the vicissitudes of the international situation. The British Isles look for and find an easier market from which they can import what they need, in the North American countries, which are nearer and much more easily accessible from many points of view. The Far East, after the beginning of hostilities in the Pacific, is in the same condition as continental Europe, and consequently the usual demand of Australian wheat cannot be substituted for Argentine wheat. The only market on which Argentina can still really count is that of her own continent, provided she does not meet there the competition of North America, which is also in serious distress under the pressure of its own extremely heavy surpluses. Even admitting that the South American continent may be left entirely open to the sole exports of Argentine wheat, and that its markets may absorb 50 million bushels, the total Argentine exports during the present season cannot amount to more than 70-80 million bushels. In such case, the Argentine surplus wheat stocks, which at August 1, 1941 amounted to about 150 millions bushels would increase, in the course of the present year, by nearly 50 millions and at August 1, 1942 would amount to 200 millions. This figure does not indicate a maximum level, but is one of the highest levels ever attained by Argentine surplus wheat stocks in these last years.

Oceania. — Wheat Production in 1941.

Wheat production in Oceania is represented by the production of Australia and the modest one of New Zealand. As in all countries where extensive cultures are practised, the variations in the Australian wheat yields are strongly influenced by atmospheric conditions. The factor that has the greatest weight on the results of the wheat crop is represented by rains in the months of Septem-

ber and October. When, in these two months, drought is more severe, Australian wheat crops are extremely poor. Such was the case in 1940-41, which was one of the worst in a long series of years. In fact unit yields, last year, were 6.7 bushels per acre.

This year it rained more abundantly and frequently during the critical months of September and October, so that the estimated production is nearly double the very poor one of last year, and may attain an average level.

Oceania. — Wheat area, production and yield per acre.

Periods	Area — million acres	Production — million bushels	Yield — bushels per acre
Average 1924-25/1928-29	12.1	151	12.5
» 1929-30/1933-34	16.1	193	12.0
» 1934-35/1938-39	13.1	161	12.3
Year 1939-40	13.6	218	16.0
» 1940-41	12.6	91	7.3
» 1941-42	12.8	170	13.3

Production in Oceania amounts normally to about 180 million bushels of which only one third is enough to fill the supply needs of Australia and New Zealand. The other two thirds are destined to exports to other continents. Australian wheat competes normally with that of the other large wheat producing countries over all the World markets; but its main outlets are the United Kingdom, the other countries of the British empire, the European continent and the Far East.

As regards exports, the situation of Australia this year is extremely precarious, and in any case far worse than that of all the other large wheat producing countries. Surplus stocks which remained unsold in the country are quite heavy, notwistanding the poor crop of last year, because exports last year were very small. These surplus stocks are enough to fill the needs of Australia during the present year. It naturally follows that the whole wheat crop which has just been harvested, amounting to 166 million bushels is available for exports abroad. But under present circumstances, it is extremely doubtful whether Australia can count on one single large market capable of absorbing a considerable part of her surplus stocks. Argentina can avail herself of the markets of Latin America, North America can count on the great markets of the British Isles, but Australia has no outlet for her wheat. In the present crisis of freights, tonnage for distant countries is lacking, and Australia is very far from all the principal wheat markets. The nearest one,—that of the countries of the eastern coast of Asia, which had already been put out of order by the blocking of the yen—, was completely cut out at the beginning of December when hostilities began on the Pacific. It is quite probable, therefore, that Australia will be the only large wheat producing country that will have to keep for herself all her exportable wheat surpluses.

The Situation of the Wheat World Market in 1941-42.

When the world constituted one economic unit and the different countries were reciprocally interdependent, surpluses of the ones were available for the needs of the others. The knowledge of what amounts were available and of

which were the needs of world markets, was extremely useful, because it was this situation that in the last instance ruled the markets, regulated prices and directed the great streams of international trade. Under the present circumstances a survey of the wheat world situation would be purely theoretical. On one side, large quantities of wheat are accumulating, while on the other side urgent and heavy needs of wheat remain unsatisfied, and, as long as the war lasts, there is absolutely no possibility that the balance may be restored.

We will therefore limit ourselves to sum up the following facts.

World wheat production in 1941 was about the same as that of the year before.

World wheat area, production and yield per acre (not including the U. S. S. R. and China).

Periods	Area — million acres	Production — million bushels	Yield — bushels per acre
Average 1924-28	237.7	3,567	15.0
» 1929-33	257.0	3,810	14.8
» 1934-38	256.5	3,785	14.8
Year 1939	257.2	4,226	16.4
» 1940	253.8	3,954	15.6
» 1941	...	4,005	...

The production of the four large wheat exporting countries taken as a whole, was above average; but this increase (a very moderate one, anyway) was due to the United States alone, while Argentina, Australia and Canada registered only average results. All these countries, at the time of the new harvest, had already large surplus stocks of unsold wheat from previous years and particularly from the production of the last two harvests. This accumulation was due to insufficient outlets where it could be sold.

There is very little chance that these surpluses may be sold during the present year. Canada and Argentina, however, seem to be in a better position than the United States and Australia and may be able to export a part of their stocks. Canada, owing to the fact that it is nearer than the other countries and for other reasons, may count on the great market of the British Isles. Moreover, it is quite possible and probable that part of British demand may be reserved to the United States. But the relief that North America may get from this quarter is very modest, as compared with the enormous surplus quantities at its disposal.

Argentina may count on demand from Latin America and especially from Brazil. But it is a small matter at its best; and besides, the competition of the United States on this market is not to be excluded. The United States which possess the largest amounts of surplus stocks, have practically no outlets for them, unless they compete with Canada and Argentina on their usual markets. Australia, after the breaking of the war in the Far East, has no important outlet near enough for the disposal of its production. Owing to the dearth of tonnage, distance has become a factor which is going to play an important part in the distribution of trade in general and of the wheat trade in particular.

The four great exporting countries will be forced, therefore, to see their surplus stocks grow larger still. In fact these surpluses are going to attain so high a level as never before in the history of world production. This enormous amount of wheat, however, though it is now excessive, may be found very useful in the days that will follow the end of the war and the conclusion of peace.

Among the other wheat exporters of lesser importance, the Danubian countries registered a moderate production, while in French North Africa, the wheat crop was quite good. Both groups are maintaining trade relations with wheat importing countries of the European continent on whose markets they sell all their surpluses. This year, their share in suppying to the needs of the continent is very modest.

Importing countries can only register a mean production. The European continent, in spite of the remarkable progress made in recent years in the production of wheat, is not in a position to fill entirely its own needs. Production, though not as low as in former times, is still insufficient, especially when (as was the case this year) their, crops are poor and the exportable supplies of the Danubian basin are weak. The old continent meets the lack of overseas imports stopped by the blockade, by balancing its wheat budget with strict economies and the regulation of consumption. Production in the British Isles was quite abundant, especially owing to the increase of area sown to wheat; but available amounts can only fill about one third of total consumption, provided such consumption is kept within normal limits. Heavy importations are necessary, therefore, and their volume is subordinated only to the amount of available shipping and to the risks of sea lines.

The Far Eastern importing countries, after the breaking of the war on the Pacific, are obliged to rely entirely upon their own resources and to substitute the consumption of wheat with that of other cereals which they produce in large amounts.

We may then conclude that the present year will be characterised by a huge abundance of exportable wheat surpluses stored in the sylos of the great over-producing countries, and by the smallness of the quantities of wheat that will find a way to international markets.

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE BARLEY AND OATS.

Bulgaria: The Central Institute of Meteorology has recently published a retrospective study on the general situation of cereals during the year 1940-41. A brief summary of it follows: The long period of drought in September and in the first two weeks of October 1940 had considerably disturbed plowing and sowings of winter cereals which had to be continued till the end of November. Intense cold in December following a rainy November might have seriously compromised the condition of winter cereals if they had not been well protected by a heavy coat of snow. In

Area and Production of Cereals.

Countries	Area					Production							
	1941	1940	Aver. 1935 to 1939	% 1941		1941	1940	Aver. 1935 to 1939	1941	1940	Aver. 1935 to 1939	% 1941	
	000 acres			1940 = 100	Aver. = 100	000 centals			000 bushels			1940 = 100	Aver. = 100
Wheat													
Belgium	439	(w) 354	394	—	111.4	...	...	9,691	...	...	16,151	...	...
Denmark	203	199	316	101.8	64.1	4,189	4.094	8,617	6,981	6,823	14,361	102.3	48.6
Spain	9,445	8.735	(1)8,639	108.1	109.3	65,377	47,648	63,270	108,959	79,412	(1)105,448	137.2	103.3
Finland	331	349	264	94.8	125.3	3,309	3,939	4,208	5,515	6,565	7,013	84.0	78.6
Ireland	491	305	225	160.9	218.4	...	7,011	4,613	...	11,685	7,689	...	...
Italy	...	12,566	12,639	...	...	157,631	156,754	167,713	262,713	261,251	279,517	100.6	94.0
Netherlands	339	331	338	102,2	100,2	...	...	9,113	...	...	15,188	...	...
Romania	(2)5,807	(2)5,014	9,054	115,8	—	(2)54,124	(2)30,225	84,491	(2)90,204	(2)50,375	140,816	179.1	—
Slovakia	550	533	(3) 539	103.1	102.1	6,955	6,740	(3) 8,572	11,591	11,233	(3)14.287	103.2	81.1
Sweden	708	763	741	92.8	95.6	7,255	9,276	15,811	12,091	15,459	26,351	78.2	45.9
Switzerland	215	191	184	112.5	116.9	...	3,631	3,711	...	6,051	6,185	...	...
Canada	22,372	28,726	25,596	77.9	87.4	181,576	330,834	187,440	302,626	551,390	312,399	54.9	96.9
Un. St. (w)	40,316	36,147	41,186	111.5	97.9	567,540	353,491	351,467	945,900	589,151	585,778	115.8	124.1
Un. St. (s)	16,467	17,356	16.387	94.9	100.5		136,528	105,964		227,547	176,606		
Mexico	1,347	1,450	1,251	92.9	107.6	8,257	8,002	7,391	13.828	13,337	12,318	103.7	112.3
India (4)	34,499	34,003	34,485	—	—	224,400	241,562	222,396	374,000	402.603	370,660	92.9	100.9
Japan	1,983	2.024	1,738	96.1	114.1	32,377	39,682	30,078	53.960	66,135	50,130	81.6	107.6
Syria and Leb.	1,600	...	1,363	...	117.4	16,560	14,760	11,692	27,600	24,600	19,486	112.2	141.6
Algeria	...	...	4,176	...	...	19,200	16,560	20,890	32.000	27,600	34,816	115.9	91.9
Egypt	1,561	1,563	1,464	99.9	106.7	24.918	29,997	27,510	41,529	49,994	45,848	83.1	90.6
Tunisia	1,322	1,359	1,884	97.3	70.2	8,819	6,393	9,019	14.697	10,655	15,031	137.9	97.8
Argentina	(5)18,039	(5)17,569	(5)18,577	102.7	97.1	136,687	162,706	131,710	227,807	271,171	219,512	84.0	103.8
Chile	1,660	1,930	1,963	86.0	84.6	...	...	18,937	...	...	31,562	...	...
Uruguay	1,043	924	1,228	112.8	84.9	...	4,235	7,954	...	7,058	13,256	...	...
Australia	12,654	12,454	13,128	101.6	96.4	99,658	49,583	101,821	166,096	82,639	169,702	201.0	97.9
New Zealand	300	240	221	125.0	135.5	6,000	5.040	4,277	10,000	8,400	7,129	119.0	140.3
Rye													
Belgium	310	280	369	110.7	84.1	...	...	7,790	...	...	13,910	...	...
Denmark	474	339	352	139.6	134.7	6,614	5,908	5,552	11,811	10,551	9,915	111.9	119.1
Spain	1,473	1,361	(1)1,302	108.2	113.1	8,754	7,740	(1) 9,041	15,632	13,821	(1)16,144	113.1	96.8
Finland	467	459	578	101.8	80.8	5,203	4,627	7,774	9,291	8,263	13,883	112.4	66.9
Netherlands	596	563	559	105.7	106,6	...	...	11,386	...	...	20,332	...	...
Slovakia	372	368	(3) 380	101.1	97.8	4.409	4,403	(3) 5,259	7,874	7,862	(3) 9,391	100.2	83.8
Sweden	509	422	495	120.5	102.7	6,113	5,862	8,304	10.916	10,468	14,828	104.3	73.6
Switzerland	35	25	38	136.2	90.6	...	498	711	...	890	1,269	...	...
Canada	1,077	1,035	816	104,1	131.9	7,374	7,837	5,147	13,167	13,994	9,191	94.1	143.3
United States	3,436	3.192	3,723	107.6	92.3	26,019	22,737	25,576	46,462	40,601	45,672	114.4	101.7
Argentina	(5)2,661	(5)2,751	(5)2,480	96.8	107,3	3,527	4,678	5,586	6,299	8,354	9,974	75.4	63.2
Chile	19	24	30	81.7	64.4	...	...	173	...	...	309	...	...
Barley													
Belgium	74	57	76	130.4	98.0	...	...	1,757	...	...	3,661	...	...
Denmark	930	956	939	97.2	99.0	20,503	25,104	25,191	42,715	52,301	52,483	81.7	81.4
Spain	3,886	3,859	(1)3.382	100.7	114.9	37,146	30,769	31,262	77,390	64.103	65,130	120,7	118.8
Finland	326	281	305	116.0	106.9	2,822	3,061	4,070	5,879	6,377	8,478	92.2	69.3
Ireland	169	132	118	128.0	143.2	...	3,114	2,598	...	6,487	5,413	...	...
Slovakia	489	497	(3) 492	98.5	99.5	5,842	6,719	(3) 6,946	12,172	13,999	(3)14,470	86,9	84.1
Sweden	244	264	252	92,6	97,0	3,514	4,173	4,777	7,322	8.694	9,952	84.2	73.6
Switzerland	44	28	12	159.0	351.0	...	511	206	...	1,066	430	...	...
Canada	5,449	4,341	4,291	125.5	127.0	56,457	50,043	42,663	117,619	104,256	88,882	112.8	132 3
United States	13,977	13,394	10,774	104.4	129.7	168,731	148,433	113,409	351,522	309,235	236,270	113.7	148.8
Japan	...	1,848	1,892	...	...	36,385	37,198	35,112	75,803	77,498	73,152	97.8	103.6

Area and Production of Cereals.

Countries	Area 1941	Area 1941	Area Aver. 1935 to 1939	% 1941: 1940 = 100	% 1941: Aver. = 100	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production 1941	Production 1940	Production Aver. 1935 to 1939	= 1941: 1940 = 100	= 1941: Aver. = 100
	000 acres					000 acres			000 bushels				
Algeria	...	...	3,058	...	...	15,360	7,920	15,415	32,000	16,500	32,114	193.9	99.6
Egypt	255	268	278	95.1	95.1	4,699	5,315	7,339	9,789	11,073	15,290	88.4	64.0
Tunisia	...	...	1,174	...	...	4,400	2,000	4,564	9,186	4,134	9,508	222.2	96,6
Argentina	(5)1,972	(5)2,139	(5)1,901	92.2	103.7	8,444	17,395	11,329	17,591	36,239	23,602	48.5	74.5
Chile	128	128	184	99.9	69.5	...	...	2,419	...	...	5,041	...	...
Uruguay	67	54	(6) 36	122.7	—	...	216	(6) 259	...	450	(6) 539	...	...
New Zealand	30	26	24	115.4	125.5	550	481	461	1,146	1,002	961	114.4	119.2
Oats													
Belgium	413	...	548	...	75.4	...	...	14,074	...	...	43,982	...	...
Denmark	846	843	926	100.3	91.4	16,314	19,641	22,303	50,982	61,378	69,697	83.1	73.1
Spain	1,646	1,597	(1)1,423	103.1	115.7	12,469	10,459	(1)10,549	38,964	32,685	(1)32,966	119.2	118.2
Finland	1,055	1,054	1,142	100.1	92.4	10,715	11,128	15,974	33,483	34,776	49,917	96.3	67.1
Ireland	779	681	571	114.4	136.5	...	16,222	12,565	...	50,694	39,265	...	...
Slovakia	370	365	(3) 333	101.5	131.3	...	4,596	(3) 3,660	...	14,363	(3) 11,437	...	...
Sweden	1,553	1,569	1,641	99.0	94.7	17,139	20,660	27,904	53,459	64,563	87,199	83.0	61.4
Switzerland	80	53	28	150.2	286.3	...	1,140	510	...	3,562	1,593	...	...
Canada	13,841	12,298	13,246	112.6	104.5	120,138	129,379	114,944	375,430	404,309	359,201	92.9	104.5
United States	37,236	34,847	35,417	106.9	105.1	364,430	395,401	329,369	1,138,843	1,235,628	1,029,279	92.2	110.6
Algeria	...	...	470	...	...	2,560	...	3,387	8,000	...	10,585	...	75.6
Argentina	(5)3,519	(5)3,899	(5)3,547	90.2	99.2	10,362	11,894	16,254	32,380	37,168	50,795	87.1	63.7
Chile	168	198	279	85.3	60.3	...	...	2,455	...	...	7,670	...	...
Uruguay	237	225	213	105,5	111.2	...	421	992	...	1,316	3,100	...	...
New Zealand	60	61	63	98.4	95.4	1.080	1,120	1,174	3,375	3,500	3,669	96.4	92.0

(*w*) Winter crop. — (*s*) Spring crop. — (1) Year 1939. — (2) Not including territories transferred in 1940. — (3) Average of two years — (4) Final estimate except for 1941 area, the figure of which is that of the fourth estimate. — (5) Area sown. — (6) Not including barley for brewery.

January 1941 the weather was less cold, and in February it was warm and dry and entirely favourable to sowings of spring cereals and to storing of winter cereals. Owing to the delay in sowing, dry weather in March and April and coldish at the beginning of May crops at that time did not appear in good condition. May rains caused an improvement, and warm and fine weather in June was favourable to the growth and ripening of the seeds. Harvest started towards the 25th of June, but was frequently interrupted by rains at the beginning of July. Owing to damages caused by laying and rust, wheat production was estimated lower than last year. Barley crops also, especially winter barley, were not very good. Winter oats suffered from the cold of the winter. Spring oats started developping well, but excessive wetness during the ripening period caused laying and rust. Oats harvesting began towards June 5-10, and average yields seemed good.

Denmark: The production of meslin in 1941 is estimated at 13,007,000 centals (22,427,000 bushels) against 15,437,000 (26,616,000) in 1940 and an average of 16,453,000 (28,367,000) in 1935 to 1939; percentages, 84.3 and 79.1.

Spain: Sowings of cereals were completed under favourable conditions, except in some zones where drought hindered plowing. Preparatory work on soil destined to spring cereals has been started.

Finland: The production of meslin in 1941 is estimated at 201,000 centals (346,000 bushels) against 279,000 (481,000) in 1940; percentage, 72.0.

Hungary: In November and during the first half of December weather conditions were generally mild and rains were few. Climate was dry and favourable to storing of crops, but unfavourable to autumn plowing. The early arrival of winter seriously hindered the completion of agricultural works in several sections of the country. Towards December 10, the climate was mild again and it was then possible to continue deep plowing to prepare the soil for spring seedings. Intense frost in the month of November did heavy damage to autumn seedings which, at that time, were still too weak.

Norway: According to press information, it had been foreseen that in 1940-41 there would be an increase of agricultural area of 138,000 acres over 1939-40, subdivided as follows: cereals, 72,000 acres of which 25,000 to wheat and rye, 47,700 acres to potatoes and 18,500 acres to root cultures. An increase of only 74 per cent. of the amount foreseen had actually been obtained. Unfortunately, bad weather conditions, characterised by a very early autumn 1940 and a delayed 1941 spring, had prevented better results. The task of agriculture now consists in completing the area foreseen for the year 1940-41 and to increase it by 17,500 acres. Consequently the total area under cultivation in 1941-42 would amount to 885,000 acres, i. e., 43 per cent. of the whole of cultivable land. 17,500 acres would be devoted particularly to potatoes. All agricultural holdings of more than 5 decares should have, in 1942, at least ⅓ of decare for each member of the holder's family for raising potatoes. If seeds of root cultures were not available in the same amount as in 1941, cereals would be planted instead of potatoes. Cultures of vegetables should also be increased by about 20 per cent.

Romania: Owing to unfavourable weather conditions in autumn and the early arrival of winter, it was not possible to put fully into effect the plan of sowings of winter cereals. Farmers have taken the maximum advantage of favourable weather, so that sowings could be started again, though in a limited way, even during the third week in December. In order to insure the normal supply for the needs of the population, a decree of 17 December blocking all available quantities of wheat, rye, barley and flours made with them, established that the only buyer of these products is the State, which will distribute them according to the needs of the population.

Serbia: According to unofficial Serbian sources, wheat production in 1941 was very good. It is estimated that it has amounted to nearly 28,7 million centals (47.0 million bushels) of which 11.0 million centals (18.4 million bushels) were produced in the Serbian Banat. Owing to this very abundant production, the victualling of the population is completely assured.

Sweden: According to press information, areas sown to wheat and winter oats in the autumn 1941 are the same as the year before, and may even be greater.

Switzerland: According to a statement by the Federal Statistical Bureau, and of the Federal War Alimentation Bureau, seeing that the spreading of the war has once more increased the difficulty of importing cereals for bread making and for forage, it was decided to increase home production to the utmost in order to meet urgent war economy needs in Switzerland. In 1941 the area to cereals was increased again by 155.000 acres.

In order to judge the work required by this increase, it must be considered that the new area destined to importance cultivation is greater than the maximum ever reached during the last world war and that in this case the amount of work required is by far greater than would be needed by a grass culture. Labour for agricultural work was, on the whole less available than during the great war. Both labour and means of transportation were subjected to far greater work than 25 years ago, in order to fill the needs of the army. Although at the beginning of the present war, agricultural implements were in greater number and more varied than before, draft animals and carburants in many places were too limited to suffice for the utilisation of mechanical means. Difficulties were to be expected. The necessary efforts were made {and difficulties overcome. Here are the results: the number of farm hands has considerably increased since 1940 (34,100) and in 1941 it amounted to 179,700 persons. Thus nearly 18 per cent. of the families can eat bread made from their own cereals. In the mountain cantons of Valais and Grisons respectively 51.3 per cent. and 34.9 per cent. of the holdings produce the foodstuff needed to fill their own needs. Since 1940, the area sown to cereals has increased 88,400 acres (25.9 per cent.), and it amounts now to 430,000 acres, i. e. 90,000 acres more than during the last war. Area sown to autumn and spring cereals has increased by 24,000 acres and it amounts to 215,000 acres. The most important crop is autumn wheat which is sown on 150,700 acres i. e 35 per cent., in a round figure, of the total area sown to cereals. The total increase of area sown to cereals amounts to 27 per cent. Among cereals for bread making, autumn rye is the most important. Meslin amounts to nearly the same as autumn wheat, while spelt production has increased but little because it cannot grow well except in wet zones and heavy soil. Area sown at present at autumn rye amounts to 30,600 acres, i. e., 8,400 acres or 37.6 per cent. above last year. Area sown to barley has increased by 60 per cent. since 1940, which means that it has more than doubled since 1917. The culture of oats covers 80,000 acres, and is more than 50 per cent. higher than in 1940.

Argentina: A telegraphic report sent by the Ministry of Agriculture of Argentina at the beginning of January, confirmed that the results of the threshing of wheat and other cereals varied from average to good. By another telegram of January 21, the Argentine Government communicated the second estimate on production of cereals. Except for wheat, the production of which shows an increase of 4,409,000 centals, (7,349,000 bushels) over the estimated amount in December, the new estimates for other cereals are considerably below those of the preceding month. The production of oats, barley and rye (see Table) are neatly below those of the year 1940-41 and of the average of the five preceding years. These poor productions are due chiefly to damages caused by frost, drought and violent winds. Wheat production, while not reaching the very high level of 1940-41, was 3.8 per cent. above the average of the five preceding years, in spite of the fact that the area sown to wheat was lower than average.

In order to avoid speculation on wheat, a decree of 15 November 1941 forbids long term sales of this product. Only wheat from the Government's storehouses can be exported.

Canada: The production of meslin (mixed grains) in 1941 is estimated at 18,549,000 centals (31,980,000 bushels) against 19,410,000 (33,465,000) in 1940 and an average of 17,328,000 (29,876,000) in 1935 to 1939; percentages, 95.6 and 107.0. The production of buckwheat is estimated at 2,639,000 centals (5,278,000 bushels) against 3,212,000 (6,424,000) in 1940 and an average of 3,669,000 (7,338,000) in 1935 to 1939; percentages, 82.2 and 71.9.

According to the same estimate the production of grains in the Prairie Provinces is as follows:

	1941	1940	Average 1935-39	% 1941 1940 = 100	% 1941 Average = 100
	(000 centals)				
Wheat	169,200	315,000	174,348	53.7	97.0
Rye	6,552	6,860	4,357	95.5	150.4
Barley	47,520	39,840	32,531	119.3	146.1
Oats	71,740	77,860	67,091	92.1	106.9
	(000 bushels)				
Wheat	282,000	525,000	290,579	53.7	97.0
Rye	11,700	12,250	7,780	95.5	150.4
Barley	99,000	83,000	67,772	119.3	146.1
Oats	211,000	229,000	197,326	92.1	106.9

Turkey: According to Turkish press information, the Ministry of Agriculture has decided to take the proper measures to further increase areas for agricultural production. Five million Turkish lire have been put at the disposal of the Ministry of Agriculture to buy seeds, plows and other implements. The same Ministry has created a centralising Bureau which will over-see activities directed to increase the country's agricultural production. This Bureau will work in collaboration with the Bureau of Agricultural " Combinats " and the Bureau of Agricultural holdings.

CURRENT INFORMATION ON MAIZE.

Bulgaria: In 1941, maize sowings, though they were hindered first by drought in March and April and then by rains and cold in the first half of May, were over at the end of May. The formation of stalks was favoured by sufficient humidity and rather warm weather in June and July. During the second half of July and in August warmer and less rainy weather was very favourable to the formation and ripening of maize grains. Generally, the 1941 production of maize has been estimated higher than that of the year before. However, in some regions of southern and south-western Bulgaria where humidity in the month of August was utterly insufficient and drought had already begun in July, yields were less abundant. In southern Bulgaria, harvesting and drying began towards the middle of September, while in the central and northern parts of the country they continued all over the month of September and the beginning of October. Cold weather and snow hindered harvesting operations in some places further north.

Serbia: Maize production in 1941 was exceptionally good. According to unofficial sources, this production has been slightly over 44.1 million centals (173.2 million bushels) of which 14.3 million centals (23.6 million bushels) were raised in the Serbian Banat. It is estimated that this abundant production will be sufficient to feed the population and livestock alike.

Argentina: According to the latest official report, the maize crop in December was in urgent need of rain.

Canada: The production of maize (corn for husking) according to the second estimate is 6,634,000 centals (11,846,000 bushels) against 3,895,000 (6,956,000) in 1940 and an average of 3,926,000 (7,010,000) in 1935 to 1939; percentages, 170.3 and 169.0. The yield per acre in 22.1 centals (39.5 bushels) compared with 20.9 (37.4) in 1940.

CURRENT INFORMATION ON RICE.

Burma: According to the latest report area cultivated to rice in 1940-41 was 12,703,000 acres, against 12,010,000 in 1939-40 and 12,356,000 on the average of the preceding 5-year period; percentages; 105.8 and 102.8. The corresponding production of paddy is estimated at about 180,732,000 centals (401,626,000 bushels) against 156,677,000 (348,171,000) and 162,536,000 (361,192,000); percentages: 115.4 and 111.2.

Reports from Rangoon indicated last November that the 1941-42 rice crop may exceed last year's bumper harvest, which was the largest produced in recent years. Some increase took place in the acreage planted in 1941, as the prevailing high prices and more liberal credit on the part of landlords tended to bring considerably more land back into cultivation. In addition, weather conditions this season had thus far been favourable, with ample rainfall and only minor floods, that have caused less than normal damage.

Indochina: According to recent press information from Saigon, the rice crop in Indochina appears to be slightly smaller than last year.

CURRENT INFORMATION ON POTATOES.

Germany: According to press information, the 1941 potato crop was higher than the average for the ten preceding years, without attaining, however, the level of the top production of 1940.

Denmark: The production of potatoes in 1940 is estimated at 29,101,000 centals (48,501,000 bushels) against 29,333,000 (48,887,000) in 1940 and an average of 28,601,000 (47,668,000) in 1935 to 1938; percentages 99.2 and 101.7.

Finland: According to the most recent estimate area cultivated to potatoes in 1941 is about 192,700 acres against 199,400 in 1940; percentage 96.7. The corresponding production is estimated at about 16,115,800 centals (26,859,000 bushels) against 32,253,700 (53,755,200); percentage 50.0.

France: According to unofficial press information, the production of potatoes in 1941 appears to have been of about 265 million centals (441 million bushels), compared with 176 million centals (294 million bushels) in 1940.

According to official statistics, average production during the period 1934-1938 amounted to 350 million centals (584 million bushels) including 26 (43) obtained in Alsace-Lorraine.

Norway: See general survey under cereals.

Sweden: The production of potatoes in 1941 is estimated at 45,629,000 centals (76,047,000 bushels) against 50,583,000 (84,304,000) in 1940 and an average of 39,979,000 (66,630,000) in 1935 to 1938; percentages, 90.2 and 114.1.

Switzerland: The area under potatoes in 1941 is estimated at 147,100 acres against 122,400 acres in 1940 and an average of 119,300 acres in 1935 to 1939; percentages, 120.2 and 123.4.

CURRENT INFORMATION ON SUGAR.

Bulgaria: According to press information, the beet area has been fixed by the Government at 74,000 acres. This acreage represents an increase of almost 21,000 acres over last year.

Production of Beet-Sugar (raw).

COUNTRIES	TOTAL PRODUCTION DURING THE SEASON: 1941-42 (1) (thousand centals)	1940-41 (thousand centals)	Average 1935-36 to 1939-40 (thousand centals)	1941-42 (1) (short tons)	1940-41 (short tons)	Average 1935-36 to 1939-40 (short tons)	% 1941-42: 1940-41 = 100	% 1941-42: Average = 100
Belgium	(2) 5,266	5,633	5,154	(2) 263,270	281,600	257,721	93	102
Bulgaria	(3) 1,235	(3) 1,052	476	(3) 62,000	(3) 52,579	23,798	117	259
Croatia	(3) 419	(3) 383	—	(3) 21,000	(3) 19,161	—	109	—
Denmark	6,283	5,490	4,949	314.000	274,000	247,463	114	127
Spain	4,079	3,530	3,251	204,000	176,497	162,545	115	125
Finland	110	165	257	6,000	8,233	12,836	67	43
France	(2) 15,310	(2) 10,377	20,513	(2) 765,486	(2) 518,857	1,025,635	148	75
Italy	10,053	13,387	8,350	503,000	669,330	417,471	75	120
Latvia	(2) 529	(2) 1,118	979	(2) 26,000	(2) 55,913	48,970	47	54
Lithuania	(2) 739	(2) 729	541	(2) 36,900	(2) 36,457	27,069	101	136
Romania	(2)(4) 2,954	1,881	2,798	(2)(4) 148,000	94,031	139,891	—	—
Serbia	(2) 799	(5) 2,425	(5) 1,913	(2) 39,928	(5) 120,000	(5) 95,665	—	—
Slovakia	1,459	(2) 1,407	(5) 1,190	72,930	(2) 70,333	(6) 60,000	104	123
Sweden	6,834	6,855	6,805	340,000	342,770	340,241	100	100
Switzerland	(2) 419	408	251	(2) 21,000	20,400	12,536	103	167
United States	(3) 30,600	37,758	30,409	(3) 1,530,000	1,887,903	1,520,407	81	101
Japan	882	643	949	40,000	34,657	47,451	127	93
Turkey	1,984	1,955	1,509	100,000	97,740	75,468	102	131

(1) Approximate data. — (2) Data of International Association for Sugar Statistics. — (3) Licht's estimate — (4) Including Northern Bucovina and Bessarabia. — (5) Former Yugoslavia. — (6) Season 1939-40.

Denmark: The production of sugar beets in 1941 is estimated at factories at 40,345,000 centals (2,017,000 short tons) against 33,457,000 (1,673,000) in 1940 and an average of 36,248,000 (1,812,000) in 1935 to 1939; percentages, 120.6 and 111.3.

Finland: According to the most recent estimate area cultivated to sugar beet in 1941 is about 8,400 acres against 8,300 in 1940; percentage 101.5. The corresponding production is estimated at about 771,600 centals (38,600 short tons) against 1,355,000 (67,800); percentage 56.9.

France: Owing to various hinderances, chiefly in the means of transportation and scarcity of labour, sugar refineries find it difficult to utilise sugar beets, the crop of which was satisfactory notwinstanding the retard in harvesting due to the same reasons. In northern France the average yield by acre amounted to 268 centals (13.4 short tons), against 220 centals (11 short tons) in 1938. In the Pas-de-Calais district the average yield by acre was 300 centals (15 short tons) against 221 centals (11 short tons) in 1938.

Italy: The "National Consortium of Sugar Producers" has published a very detailed report on the condition and results of the sugar beet crop in 1941. Here is a short summary of the Consortium's statement.

The Ministry of Agriculture and Forests had assigned only 400,000 acres, against 445,000 the year before, to the sugarbeet crop. The decision of the Ministry had been dictated by the fact that there was a heavy surplus from the abundant crop of 1940, and also by the wish to dedicate a greater area to other crops, especially hemp. But as a matter of fact farmers engaged themselves to cultivate only 385,000 acres, of which not more than 350,000 were actually sown to beets. Farmers preferred to leave a larger area to other crops that were more advantageous from an economic

Production of Cane-Sugar.

COUNTRIES	1940-41 (1)	1939-40	Average of 1934-35 to 1938-39	1940-41 (1)	1939-40	Average of 1934-35 to 1938-39	% 1940-41: 1939-40 = 100	% 1940-41: Average = 100
	000 centals			short tons				
AMERICA.								
Antigua	540	309	520	27,000	15,000	25,984	175	104
Argentina	11,865	11,499	8,804	593,245	574,953	440,171	103	135
Barbados	1,698	1,587	2,718	85,000	79,000	135,905	107	62
Brazil	28,338	26,277	23,231	1,416,900	1,313,800	1,161,530	108	122
Colombia	1,060	904	809	53,010	45,000	40,428	117	131
Cuba	(2) 54,678	63,163	60,266	(2) 2,733,880	3,158,000	3,013,269	87	91
United States (La. & Fl.)	6,729	10,392	8,528	336,453	519,597	426,400	65	79
British Guiana	4,255	3,748	4,233	213,000	190,000	211,669	114	101
Dutch Guiana	331	245	359	17,000	12,240	17,967	135	92
Jamaica	3,492	2,227	2,289	174,600	111,000	114,455	157	153
Martinique	1,213	1,323	1,167	61,000	70,000	58,359	92	104
Mexico	7,275	6,834	6,763	360,000	340,000	338,128	106	108
Paraguay	273	240	(3) 152	13,700	12,000	(3) 7,604	114	180
Peru	8,929	8,897	8,426	446 000	444,829	421,291	100	106
Puerto Rico	18,629	20,375	17,748	931,000	1,018,700	887,390	91	105
Dominican Republic	8,779	10,027	9,339	438,944	501,366	466,926	88	94
St. Kitts	851	692	700	42,500	34,600	34,977	123	122
St. Lucia	227	180	180	11,330	8,990	9,008	126	126
Trinidad	2,734	2,065	3,086	137,000	103,250	154,308	132	89
Venezuela	611	542	514	30,500	27,100	25,706	113	119
Total America	*162,507*	*171,526*	*159,832*	*8,122,062*	*8,579,425*	*7,991,475*	*95*	*102*
ASIA.								
Taiwan	17,593	26,630	23,776	880,000	1,331,500	1,188,782	66	74
India	77,698	74,120	72,761	3,884,800	3,706,000	3,638,000	105	107
Japan	2,205	3,386	2,751	100,000	169,300	137,560	65	80
Java	37,599	35,385	23,832	1,879,946	1,769,236	1,191,582	106	158
Philippines	(2) 21,839	(2) 21,065	21,141	(2) 1,091,900	(2) 1,053,200	1,057,042	104	103
Total Asia	*156,934*	*160,586*	*144,261*	*7,836,646*	*8,029,236*	*7,212,966*	*98*	*109*
AFRICA.								
Egypt	3,836	3,524	3,213	192,000	176,198	160,668	109	119
Mauritius	6,972	5,059	6,150	348,600	252,930	307,505	138	113
Reunion	2,441	1,622	1,782	122,000	81,100	89,098	150	137
Union of South Africa	11,463	11,839	10,010	570,000	592,000	500,515	97	115
Total Africa	*24,712*	*22,044*	*21,155*	*1,232,600*	*1,102,228*	*1,057,786*	*112*	*117*
OCEANIA.								
Australia	18,010	20,787	16,607	900,500	1,039,400	830,341	87	108
Hawaii	19,379	19,028	19,112	969,000	951,400	955,596	102	101
Fiji Islands	2,654	2,557	2,973	132,677	128,000	148,630	104	89
Total Oceania	*40,043*	*42,372*	*38,692*	*2,002,177*	*2,118,800*	*1,934,567*	*94*	*103*
TOTALS	**384,196**	**396,528**	**363,940**	**19,193,485**	**19,829,689**	**18,196,794**	**97**	**106**

(1) Approximate data. — (2) Willet & Gray estimate. — (3) Average of two years.

point of view, because the price of sugarbeets was kept at a level only very slightly above that of 1939. Sowings were made late (especially in central and southern Italy) on account of prevailing cold in the month of March. Germination however was generally regular, especially where national seeds were sown which grew in a very uniform manner. Owing to failure of the first sowing, 5,000 acres, i. e., 1.3 per cent. of the whole area, had to be sown again. After April and until the middle of June, cold,

rain and sometimes even hail did damage to the crop and hindered agricultural work all over northern Italy. By the middle of June, the temperature rose rapidly and remained warm and dry until the end of July, drying the soil, particularly clayey soil. Yet, considering the rather unfavourable course of the weather, the crop was quite abundant, especially in the Po valley. In the central and southern sections of the country, the harvest was poor; but, taking the country as a whole, the sugar-beet crop may be considered good. It is calculated that, owing to high prices paid for forages, nearly 6,600,000 centals (330,000 short tons) of sugarbeets were sold for animal feeding.

Sweden: The production of sugar beets in 1941 is estimated at 40,633,000 centals (2,032,000 short tons) against 40,991,000 (2,050,000) in 1940 and an average of 41,783,000 (2,089,000) in 1935 to 1938; percentages, 99.1 and 97.2.

CURRENT INFORMATION ON VINES.

Bulgaria: In 1940, especially in some parts of southern Bulgaria, cold weather and ioidium damaged vines quite badly. Vines which grew before Spring in 1941 suffered severely from cold weather in the month of April. Frequent rains during the summer favoured the development of ioidium which could not be fought with all the necessary energy. Consequently, the production of raisins in 1941 was rather weak and in some regions it was even compromised to the extent of from 70 to 80 per cent.

France: Wine production in France in 1941, on the basis of *yield declaration*, is estimated at 934,016,000 Imperial Gallons (1,121,669,000 American Gallons) compared with 985,490,000 (1,183,485,000) in 1940 and 1,276,491,000 (1,532,951,000) on the average of the 5-year period 1935-39; percentages: 94.8 and 73.2 (*Le Progrès agricole et viticole*).

Algeria: Wine production in Algeria in 1941 is estimated at 230,094,000 Imperial Gallons (276,323,000 American Gallons) compared with 308,714,000 (370,737,000) in 1940 and 375,387,000 (450,806,000) on the average of the 5-year period 1935-39; percentages: 74.5 and 61.3. (*Le Progrès agricole et viticole*).

French Morocco: According to press information, the production of wine in 1941 amounted to almost 10,998,800 Imperial gallons (13,208,500 American gallons), against 15,398,300 Imperial gallons (18,492,000 American gallons) in 1940 and 11,989,000 Imperial gallons (14,397,300 American gallons) as an average in the years 1934-38.

CURRENT INFORMATIONS ON OLIVES.

Spain: The olive crop is good and quality satisfactory.

CURRENT INFORMATION ON FLAX.

France: According to press information, the area destined to flax this year will probably be inferior to that of 1941 for lack of fertilizers.

Switzerland: According to press information the area under flax in 1941 is estimated at 151 acres against 30 acres in 1940; percentage, 500.0.

Argentina: According to an official report sent at the beginning of January, linseed yields were good. By a telegram dated January 21, the Argentine Government communicated the second estimate of linseed production, which shows a de-

crease of 661,000 centals (1,181,000 bushels) as compared with the December estimate. Notwistanding this decrease, this year production, according to the most recent estimate (36,817,000 centals 65,745,000 bushels), is 14.4 per cent. higher than that of 1940-41 (32,179,000 centals, 57,462,000 bushels) and 11.9 per cent. above the average of the five preceding years. The good results of this year were obtained on an area which coincides with that of 1940-41, but which is 7.6 per cent. lower than average.

By a decree of November 15, 1941 long term sales of lin-seed are forbidden. This measure is intended to prevent speculation on this product. Exports are limited to product in the Government's storehouses.

Canada: According to the second estimate, the production of linseed in 1941 amounts to 3,625,000 centals (6,473,000 bushels) against 1,707,000 (3,049,000) in 1940 and an average of 858,000 (1,533,000) in 1935 to 1939; percentages, 212.3 and 422.3. The corresponding figures for the Prairie Provinces only are: 3,528,000 (6,300,000), 1,610,000 (2,875,000), and 797,700 (1,424,500); percentages: 219.1 and 442.3.

CURRENT INFORMATION ON COTTON.

Bulgaria: Rather cold weather in June and at the beginning of July had retarded the normal growth of cotton, particularly in Northern Bulgaria. Moldiness was registered in some places. Flowering began during the second half of July. In some localities of Southern Bulgaria the growth of cotton had been hindered by drought during the month of August; ripening was retarded by early Autumn cold. Cotton picking in Southern Bulgaria had started only during the second half of September and had continued till the beginning of October. Cold and snow in October delayed picking in some places. The crop was not good.

Angola: According to press information, the cultivation of cotton in Angola increases from year to year, and in 1941 the area sown to this crop amounted to 20.000 acres.

CURRENT INFORMATION ON HEMP.

Hungary: The program of intensification of the production of industrial plants, foresees in 1942 a considerable increase of the cultivation of hemp for flax.

Switzerland: According to press information the area under hemp in 1941 is estimated at 40 acres against 5 acres in 1940; percentage 800.0.

CURRENT INFORMATION ON TOBACCO.

Bulgaria: The plantation of tobacco was done in good conditions, owing to sufficient wetness of the soil. Growth started favourably. Rather dry and warm weather in the second half of July and in August was favourable to harvesting and drying operations which started about the middle of July. The 1941 production of tobacco was generally of good quality; but as to quantity it was lower than the year before, especially in the south-west and south of the country where the crop was damaged by drought. Cold weather in September retarded tobacco drying operations. Picking had been started late.

Croatia: According to press information, the cultivation of tobacco is increasing in Herzegovina and Dalmatia. In 1941 the area sown to tobacco reached 13,200 acres and the corresponding production is estimated at from 11 to 15 million lbs., i. e., nearly 35 per cent. of the total production of former Jugoslavia.

Switzerland: Tobacco is not only important as raw material for the making of smoking articles and in the industry for the war on pests, but it has also an economic war rôle thanks to the possibility of employing its seeds in the making of oil. Area sown to tobacco in 1941 is not much different from that of 1940 (1,646 acres in 1941, against 1,606 acres in 1940 and an average of 1,409 acres during the five year period 1935/39). Percentages: 102.5 and 106.8. The increase of 40 acres was registered in regions that are outside the tobacco production center.

Argentina: According to press information, the area destined to the cultivation of tobacco in 1941-42 would amount to 49,400 acres. This estimate has been made by the Bureau of Statistics, and shows a decrease of 4,500 acres, i. e., 8.3 per cent. as compared with the year before. This reduction must be attributed to the general condition of the market. As compared with the average of the five years 1935-36-1939-40, amounting to 39.000 acres, area sown to tobacco in 1941-42 shows an increase of 27 per cent.

Mexico: The production of tobacco in 1941 is estimated at 33,000,000 pounds against 52,300,000 in 1940 and an average of 38,133,000 in 1935 to 1939; percentages, 63.1 and 86.5.

Turkey: According to press information, in the interior of the Izmir province, which is the most important tobacco raising region, in the year 1941, the acreage to tobacco amounted to 113,700 acres, against 117,900 in 1940 and 111,500 in 1939. Production in 1941 is estimated at 62,832,000 lbs., against 77,160,000 lbs. in 1940. As to quality, the 1941 crop is much superior to those of 1938 and 1939, but a little inferior to that of 1940. Leaves are somewhat smaller than usual and damaged by maladies. In another tobacco producing region, along the Black Sea litoral, the 1941 production is estimated at 13,173,000 lbs. In the third tobacco producing province, that of Taçova and more specifically in the districts of Erbaa, Niksar and Tokat, the 1941 crop is estimated at 5,622,000 lbs. Thus the total 1941 production in these three regions which yield over one half of the whole tobacco production in Turkey, would amount to nearly 81,572,000 lbs.

CURRENT INFORMATION ON OTHER PRODUCTS.

Coffee.

Brazil: The amount of coffee available in all Brazilian ports at December 31, 1941, was 271,000, thousand pounds against 273,000 thousand pounds at the same date the year before.

Venezuela: According to the National Coffee Institute, coffee stocks existing in the country at September 20, 1941 amounted to 50,266 thousand pounds.

Soya.

Bulgaria: The soya crop ripened too soon in 1941 and suffered from drought. Yields however were generally excellent. The whole production was about the same as in 1940.

The Bulgarian Council of Ministers issued a decree whereby the area sown to soya in 1942 will be increased to 173,000 acres, against 99,000 acres in 1941. The greatest increase will be registered in Dobroudja. The price of soya beans was raised at the beginning of the new year to 6.50 levas per kilogram.

Sunflower.

Bulgaria: Early sunflowers began to flower towards the middle of June and by the beginning of July were flowering fully all over the country. Growth proceeded well owing to sufficient humidity and frequent sunny days. Picking operations started about August 5 in the south and about the 12th in the north. Early varieties yielded well in 1941, and the production was not lower than the year before, while late varieties which ripened too soon owing to warm weather in August, suffered from drought and their yield was lower than average.

CURRENT INFORMATION ON FODDER CROPS.

Denmark: According to the most recent informations, the production of the main fodder crops in 1941, compared with those of 1940 and the average of the five preceding years was as follows:

	1941	1940	Average 1935-39	1941	1940	Average 1935-39	% 1941 1940 = 100	% 1941 Average = 100
		1,000 centals			1,000 short tons			
Mangolds	135,144	156,661	211,933	6,757	7,833	10,597	86.3	63.8
Turnips	10,582	9,480	15,800	529	474	790	111.6	67.0
Kohlrabi	253,092	250,666	254,410	12,654	12,533	12,720	101.0	99.5
Permanent meadows (hay) . .	5,732	7,716	10,661	287	389	533	74.3	53.8
Artificially sown meadows (hay).	11,464	20,503	30,501	573	1,025	1,525	55.9	37.6

Finland: The production of hay of artificially sown meadows in 1941 is estimated at 42,770,000 centals (2,138,500 short tons) against 37,687,000 (1,884,300) in 1940; percentages, 113.5. The corresponding figures for hay of permanent meadows are: 3,924,400 centals (196,200 short tons) 3,990,400 (199,500) and 98.3 %.

Hungary: Towards the 10th of December the stock of fibrous forages was estimated sufficient for the winter needs of animals; but farmers must practice severe economies in seeds and forage beets.

Sweden: The production of hay of artificially sown meadows in 1941 is estimated at 45,922,000 centals (2,296,000 short tons) against 67,421,000 (3,371,000) in 1940 and an average of 111,404,000 (5,570,000) in 1935 to 1939; percentages, 68.1 and 41.2. The corresponding figures for fodder roots are: 52,977,000 centals (2,649,000 short tons) 52,331,000 centals (2,617,000 short tons), 60,925,000 centals (3,046,000 short tons) percentages 101.2 and 87.0 %.

Switzerland: Hay harvesting in 1941 was done under the most favourable weather conditions in the greatest number of regions. The second harvest was also very good. Consequently the quality of dry grass is much better than in the preceding years and the product obtained by it contains a high percentage of nutritive matter. The yields of pastures has been generally satisfactory.

Argentina: In December, the condition of pastures and meadows in the country as a whole was good.

LIVESTOCK AND DERIVATIVES

LIVESTOCK IN SLOVAKIA.

From statistical data on the number of livestock existing in Slovakia at January 1, 1941, and January 1, 1940, it results that there has been a decrease of 1.3 per cent. in the number of oxen, 1.5 per cent. in the number of horses, 5.7 per cent. in the number of goats and 8.9 per cent. in the number of sheep. The number of hogs, on the contrary, has increased 12-7 per cent.

CLASSIFICATION	Estimate at 1 January 1941	Estimate at 1 January 1940
Horses	164,201	166,648
Horses under 1 year old	*11,622*	*10,864*
Colts	5,855	5,509
Fillies	5,767	5,355
Horses from 1 to 3 years old.	*25,688*	*30,285*
Stallions	7,894	8,493
Geldings	6,425	9,653
Mares	11,369	12,139
Horses from 3 to 15 year sold	*110,146*	*108,493*
Stallions	4,885	5,402
for breeding	(466)	(1,216)
others	(4,419)	(4,176)
Geldings	54,629	54,914
Mares	50,632	48,187
Horses 15 years old and over.	*16,745*	*17,006*
Stallions:	680	1,059
for breeding	(4)	(201)
others	(676)	(858)
Geldings	10,086	10,021
Mares	5,979	5,926
Asses	262	268
Hinnies	6	28
Mules	15	27
Goats	75,368	79,966
He-goats	966	1,267
She-goats for reproduction.	74,060	76,726
Others goats	342	1,973

CLASSIFICATION	Estimate at 1 January 1941	Estimate at 1 January 1940
Cattle	902,610	914,056
Calves under 1 year old	*161,508*	*158,781*
Cattle 1 year old and over	*131,503*	*146,443*
Bulls	17,196	17,819
Heifers not covered	54,844	57,059
Heifers in calf	29,601	35,368
Steers	29,862	36,197
Cattle 2 years old and over	*609,599*	*608,832*
Bulls	5,828	5,250
Heifers not covered	13,460	16,339
Heifers in calf	28,450	30,035
Steers	77,707	80,618
Cows	484,154	476,590
for reproduction	(676,662)	(469,142)
other	(7,492)	(7,448)
Cows for work	(148,810)	(150,114)
Steers for work	(78,151)	(77,371)
Sheep	279,554	306,812
Sheep under 6 months old	*10,747*	*12,672*
Sheep 6 months old and over	*268,807*	*294,140*
Rams	4,311	5,853
Wethers	4,979	8,920
Ewes	259,517	279,367
Pigs	506,272	449,362
Brood sows	(1) *76,996*	(1) *89,555*
Brood sows from 6 months to 1 year old	29,142	40,052
Brood sows 1 year and over	47,854	49,503
Other pigs	(2) *427,838*	(2) *358,015*
Sucking pigs under eight weeks old	80,457	80,667
Pigs 8 weeks old and less than 6 months	241,716	191,726
Pigs 6 months old and over	105,665	85,622
Pigs for breeding	*1,438*	*1,792*

(1) Excepting sows for fattening. — (2) Including sows for fattening.

LIVESTOCK IN ROMANIA.

According to the provisional data communicated by the Romanian Ministry of Agriculture, the number of livestock in Romania in 1941, as compared with the years 1940 and 1938, was as follows:

Number of Livestock in Romania.

KIND	Territorries left to Romania after all territorial cessions		Romania before territorial cessions
	1941	1940	1938
Horses	1,102,596	1,126,277	2,158,266
Cattle	2,841,638	2,642,747	4,336,321
Sheep	7,861,582	7,856,160	12,767,510
Goats	211,144	...	398,501
Hogs	1,1655,241	1,705,453	3,164,571
Fowls	23,281,741	20,756,257	34,666,031

As compared with 1940, the changes in number registered in 1941 are generally weak, except in the case of fowls. The increase of over 7 per cent. in the number of cattle in 1941 may be accounted for considering the very severe measures taken by the Government to limit slaughterings. Changes registered in 1940 and 1941, as compared with 1938, were due chiefly to territorial re-arrangements, and, in a certain measure, to the effects of the war on the economy of that country.

In Bessarabia and in Northern Bukovina the number of livestock in 1941, compared with 1939, was as follows:

Number of heads.

KIND	Bessarabia		Northern Bukovina	
	1941	1939	1941	1939
Horses	286,669	453,827	41,810	40,436
Cattle	446,269	505,454	125,878	98,139
Sheep	1,285,343	1,806,175	135,902	136,005
Goats	18,262	11,196	6,455	4,171
Hogs	325,416	280,403	74,689	54,358
Fowl	6,185,177	6,624,691	881,341	646,303

In Northern Bukovina has been registered an increase of 3.39 per cent. in the number of horses, 28.26 per cent. in the number of cattle, 54.76 per cent. in the number of goats, 37.40 per cent. in the number of hogs and 36.37 per cent. in the number of poultry. A very small decrease has been registered in the number of sheep.

In Bessarabia on the contrary all heads, except goats and hogs, show decreases which amount to 36.84 per cent. in the number of horses, 11.71 per cent. in the number of oxen, 28.82 per cent. in the number of sheep and 6.64 per cent. in the number of fowl. Hogs have increased 16.04 per cent. and goats 63.11 per cent.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Hungary: Towards December 10, with the exception of a few isolated cases, no epidemics were registered among livestock. The condition of animals was generally satisfactory.

Switzerland: According to the results of a survey made by the Information Bureau of the Union suisse des paysans, milk deliveries in November 1941 were 6.8 per cent. below those of the same month in 1940. The 1941 results, however, may be considered satisfactory, if the fact is taken into account that in November 1940 milk deliveries had been 6.5 per cent. above those of November 1939.

A new reduction in the number of hens had to be made in 1941 owing to the scarcity of feed. As a result of this unfavourable condition, deliveries of eggs to markets decreased considerably. The number of eggs delivered to sale cooperatives was 11.5 millions lower than in 1940. At the same time imports decreased also, and eggs were very scarce in the centers of consumption during the second half of the year.

Weather conditions in 1941 were not favourable to apiculture. Bees had to be partially nourished. Production of honey was weak, averaging only 2.8 kilograms per swarm against 5.5 kilograms in 1940.

Argentina: In December, the health conditions of cattle was good all over the country.

According to press information, the caseine production in 1942 should be about 10 per cent. higher than in 1941. This increase is due to an increase in the number of factories and to improvements in the organization of factories which already existed in the country.

According to a statement of the cooperative slaughter-houses association, in 1941 the number of hogs slaughtered was only 2,387,000 against 4,074,000 in 1940. The cooperative slaughter-houses contribute about 86 per cent. of the total of slaughterings. A reduction of 41 per cent. has been registered, which is shared in equal parts by cooperative and private slaughter-houses.

TRADE

Products and Units	November: Exports 1941	November: Exports 1940	November: Imports 1941	November: Imports 1940	Total from the begining of the season *): Exports 1941	Exports 1940	Imports 1941	Imports 1940	Season: Total for Twelve Months: Exports 1940 or 1940-41	Imports 1940 or 1940-41
PORTUGAL										
Vheat: 1,000 centals	0	0	609	71	0	0	1,528	617	0	2,251
» : Thous. bush. of 60 lb.	0	0	1,015	119	0	0	2,547	1,028	0	3,752
Vheat flour: 1,000 centals	0	0	0	1	0	0	2	6	0	18
Vheat flour: Thous. bush. of 196 lb.	0	0	0	0	0	0	1	3	0	9
Iaize: 1,000 centals.	0	2	90	79	0	2	90	79	9	1,760
» : Thous. bush. of 56 lb.	0	4	161	141	0	4	161	141	17	3,142
ice: 1,000 centals	0	0	3	4	38	2	83	167	2	169
» : Thous. bush. of 45 lb.	0	0	7	9	84	3	185	372	3	375
inseed: 1,000 centals	0	0	0	0	0	0	11	62	0	62
inseed: Thous. bush. of 56 lb.	0	0	0	0	0	0	19	111	0	111
otton: 1,000 centals	0	0	49	13	0	0	202	95	0	427
» : Thous. bales of 478 lb.	0	0	10	3	0	0	42	20	0	89
Vool 1,000 lb.	0	0	0	22	0	0	9	112	0	7,086
utter: » »	46	51	0	0	309	196	0	0	229	0
heese: » »	49	29	0	0	304	243	20	31	273	35
acao: » »	2	0	282	223	2	0	474	478	119	2,597
ea: » »	—	—	33	53	—	—	154	119	—	492
offee: » »	9	71	247	1,239	262	2,046	1,927	6,859	3,305	15,413
SWEDEN										
Vheat: 1,000 centals	—	—	0	114	—	—	1	184	—	277
» : Thous. bush. of 60 lb.	—	—	1	191	—	—	1	306	—	461
ye: 1,000 centals	—	—	0	152	—	—	0	566	—	835
» : Thous. bush. of 56 lb.	—	—	0	272	—	—	0	1,010	—	1,491
ats: 1,000 centals	—	—	4	365	—	—	52	551	—	695
» : Thous. bush. of 32 lb.	—	—	12	1,140	—	—	163	1,722	—	2,172

* January 1-November 30: Rice, Linseed, Butter, Cheese; July 1-November 30: Tea, Coffee; August 1-November 30: Wheat, Wheat Flour, Rye, Oats, Cotton; September 1-November 30: Wool; October 1-November 30: Cacao; November 1-October 31: Maize.

SPAIN

Trade for the Year 1940 (January 1-December 31)

Products and units	Exports	Imports
Wheat . . . . 1000 centals	138	14,860
» . . . . Thous. bush. of 60 lb.	230	24,766
Wheat flour . . . . . . 1000 centals	509	687
» » . Thous. bbl. of 196 lb.	260	350
Rye . . . . 1000 centals	1	13
» . . . . . Thous. bush. of 56 lb.	2	23
Barley . . . . 1000 centals	61	128
» . . . . Thous. bush. of 48 lb.	127	267
Oats . . . . 1000 centals	0	134
» . . . . Thous. bush. of 32 lb.	0	419
Maize . . . . 1000 centals	17	706
» . . . . Thous. bush. of 56 lb.	30	1,261
Rice . . . . 1000 centals	236	1,218
» . . . . Thous bush. of 45 lb.	525	2,708
Linseed . . . . 1000 centals	0	78
» . . . Thous. bush. of 56 lb.	0	140
Cotton . . . . 1000 centals	1	1,637
» . . . Thous. bales of 478 lb.	0	342
Wool . . . . Thousand pounds	829	37
Butter . . . . Thousand pounds	134	2
Cheese . . . . Thousand pounds	10,395	917
Cacao . . . . Thousand pounds	0	34,765
Tea . . . . Thousand pounds	7	64
Coffee . . . . Thousand pounds	0	13,459

BRAZIL

Trade for the Year 1940 and 1939

Products and units	1940 (January 1-Dec. 31)	1939 (January 1-Dec. 31)
Exports		
Maize . . . . 1000 centals	561	1,591
» . . . . Thous. bush of 56 lb.	1,002	2,840
Rice . . . . 1000 centals	904	1,332
» . . . . Thous. bush. of 45 lb.	2,009	2,959
Cotton . . . . 1000 centals	4,944	7.133
» . . . Thous. bales of 478 lb.	1,034	1,492
Cacao . . . . Thousand pounds	235,452	269,529
Coffee (1) . . . . . Thousand pounds	1,593,804	2,182,387
Imports		
Wheat . . . . 1000 centals	18,912	21,097
» . . . . Thous. bush. of 60 lb.	31,520	35,161
Wheat flour . . . . . 1000 centals	397	748
» » . Thous. bbl. of 196 lb.	203	382

(1) Export of coffee for 1941 amounts to 1,462,208,000 pounds.

PRICES

THE PRICES OF CEREALS OF THE 1941 CROP

In the following notes information will be found on the prices of cereals of the 1941 crop which was not yet available at the time of the publication of the August and September 1941 issues of the Crop Report (pp. 413-420 and 456-459 respectively). In a separate article (pp. 39-47) are given tables, as complete as possible, on the prices of the same cereals during the last three years.

Bulgaria.

Wheat and rye. — The Government has paid farmers a premium of 100 leva per quintal above the prices published in the Crop Report of August 1941. This premium was paid until October 30. New prices were fixed on October 31 and are still holding. They correspond to the old prices including premiums.

Maize. — The base price paid by the Direction for the Purchase and Exportation of Cereals which was set at 400 leva per quintal on September 5, 1941, has been reduced by 30 leva for the period November 1, 1941, to April 30, 1942. After that date it will be again 400 leva. Selling prices are established as follows:

Sales to the Army Service Corps and to the Bureau of Labour	500 leva per quintal
Sales to millers	510 ,, ,, ,,
Sales to wholesalers of Great Sofia	535 ,, ,, ,,
Sales to retailers of Great Sofia	600 ,, ,, ,,

Rice. — The selling price of millers, free at rice-mill, during the month of September was 2050 leva per quintal for rice "Pembe" and 1900 leva for the other qualities. Purchase prices free at the buyer's station, during the same month, were 2160 and 2010 leva respectively. These prices are increased by 10 leva per quintal and per month until and including the month of September 1942.

Croatia.

Maize. — The price to be paid to producers for shelled maize of the new crop, dried, with 16 per cent. humidity, has been fixed at 350 kunas per quintal, free at Mitrovica station. For maize having a higher degree of humidity, the

price is lower (minimum 280 kunas). Monthly increases have been fixed; they regard only maize not completely dry.

The price of unshelled maize is 210 kunas at the beginning and 280 kunas at the end of the season.

Spain.

Wheat. — In the Crop Report of September 1941, pp. 456-457, we indicated the supplement of 5 or 10 pesetas for wheat delivered to the Governmental Wheat Office before November 1 in certain regions and before December 1 in the remainder of the country. The supplement of 10 pesetas is given for wheat grown anywhere in Spain, except such zones of the Provinces of Badajoz, Huelva, Cadiz, Malaga, Granada and Jaen which were not inundated during the winter of 1940. In the latter zones the supplement amounts to 5 pesetas.

Rice. — According to an order of September 22, 1941, the price of raw rice to be paid free at producer's granery, for a dry, sound, well-cleaned product, has been increased, as compared with last year in the following measure:

SPECIFICATION	1941-42 season	1940-41 season	1939-40 season
	pesetas per quintal		
Current quality rice produced in the regions of:			
Valencia, Castellon, Alicante, Murcia, Albacete, Gerona	91	81	[1] 74
Ebro, Barcelona, Balearic Islands	90	79	[2] 71
Andalusia	90	80	72
Special varieties: Bomba, Bombon and similar	135	121	95

[1]) All Spain, except the Province of Tarragona and Andalusia. — [2]) Province of Tarragona.

Prices are reduced by 1,25 pesetas per quintal for deliveries before November 15 in the regions of the Ebro, Barcelona and the Balearic Islands, and before October 18 in the other regions. Later it was decided that, above these prices, producers will receive a premium of 10 pesetas which is not calculated in the prices established for subsequent sales.

The selling price, f. o. r. rice-mill, for white rice, current quality, is fixed at 137 pesetas per quintal, without sacks. For rice of special qualities that are sold in sealed bags of 10 kg, with indication of quality, price etc., a scale has been fixed with a maximum of 233.50 pesetas per quintal. These prices are subject to an increase of 9 pesetas per quintal when sold by wholesalers and to a further increase of the same amount for sales by retailers.

Finland.

Wheat, rye, barley, oats. — In the September 1941 Crop Report (pp. 457-458) were mentioned prices of cereals of the new crop. These prices hold for the quantities that farmers are obliged to turn over to the Bureau of Victualling.

TRADE

Products and Units	November				Total from the begining of the season *)				Season: Total for Twelve Months	
	Exports		Imports		Exports		Imports		Exports	Imports
	1941	1940	1941	1940	1941	1940	1941	1940	1940 or 1940-41	1940 or 1940-41
PORTUGAL										
Wheat: 1,000 centals	0	0	609	71	0	0	1,528	617	0	2,251
» : Thous. bush. of 60 lb.	0	0	1,015	119	0	0	2,547	1,028	0	3,752
Wheat flour: 1,000 centals	0	0	0	1	0	0	2	6	0	18
Wheat flour: Thous. bush. of 196 lb. .	0	0	0	0	0	0	1	3	0	9
Maize: 1,000 centals.	0	2	90	79	0	2	90	79	9	1,760
» : Thous. bush. of 56 lb.	0	4	161	141	0	4	161	141	17	3,142
Rice: 1,000 centals .	0	0	3	4	38	2	83	167	2	169
» : Thous. bush. of 45 lb.	0	0	7	9	84	3	185	372	3	375
Linseed: 1,000 centals	0	0	0	0	0	0	11	62	0	62
Linseed: Thous. bush. of 56 lb.	0	0	0	0	0	0	19	111	0	111
Cotton: 1,000 centals	0	0	49	13	0	0	202	95	0	427
» : Thous. bales of 478 lb.	0	0	10	3	0	0	42	20	0	89
Wool 1,000 lb. . .	0	0	0	22	0	0	9	112	0	7,086
Butter: » » . .	46	51	0	0	309	196	0	0	229	0
Cheese: » » . .	49	29	0	0	304	243	20	31	273	35
Cacao: » » . .	2	0	282	223	2	0	474	478	119	2,597
Tea: » » . .	—	—	33	53	—	—	154	119	—	492
Coffee: » » . .	9	71	247	1,239	262	2,046	1,927	6,859	3,305	15,413
SWEDEN										
Wheat: 1,000 centals	—	—	0	114	—	—	1	184	—	277
» : Thous. bush. of 60 lb.	—	—	1	191	—	—	1	306	—	461
Rye: 1,000 centals .	—	—	0	152	—	—	0	566	—	835
» : Thous. bush. of 56 lb.	—	—	0	272	—	—	0	1,010	—	1,491
Oats: 1,000 centals .	—	—	4	365	—	—	52	551	—	695
» : Thous. bush. of 32 lb.	—	—	12	1,140	—	—	163	1,722	—	2,172

* January 1-November 30: Rice, Linseed, Butter, Cheese; July 1-November 30: Tea, Coffee; August 1-November 30: Wheat, Wheat Flour, Rye, Oats, Cotton; September 1-November 30: Wool; October 1-November 30: Cacao; November 1-October 31: Maize.

SPAIN

Trade for the Year 1940 (January 1-December 31)

Products and units		Exports	Imports
Wheat	1000 centals	138	14,860
»	Thous. bush. of 60 lb.	230	24,766
Wheat flour	1000 centals	509	687
» »	Thous. bbl. of 196 lb.	260	350
Rye	1000 centals	1	13
»	Thous. bush. of 56 lb.	2	23
Barley	1000 centals	61	128
»	Thous. bush. of 48 lb.	127	267
Oats	1000 centals	0	134
»	Thous. bush. of 32 lb.	0	419
Maize	1000 centals	17	706
»	Thous. bush. of 56 lb.	30	1,261
Rice	1000 centals	236	1,218
»	Thous. bush. of 45 lb.	525	2,708
Linseed	1000 centals	0	78
»	Thous. bush. of 56 lb.	0	140
Cotton	1000 centals	1	1,637
»	Thous. bales of 478 lb.	0	342
Wool	Thousand pounds	829	37
Butter	Thousand pounds	134	2
Cheese	Thousand pounds	10,395	917
Cacao	Thousand pounds	0	34,765
Tea	Thousand pounds	7	64
Coffee	Thousand pounds	0	13,459

BRAZIL

Trade for the Year 1940 and 1939

Products and units		1940 (January 1-Dec. 31)	1939 (January 1-Dec. 31)
Exports			
Maize	1000 centals	561	1,591
»	Thous. bush of 56 lb.	1,002	2,840
Rice	1000 centals	904	1,332
»	Thous. bush. of 45 lb.	2,009	2,959
Cotton	1000 centals	4,944	7,133
»	Thous. bales of 478 lb.	1,034	1,492
Cacao	Thousand pounds	235,452	269,529
Coffee (1)	Thousand pounds	1,593,804	2,182,387
Imports			
Wheat	1000 centals	18,912	21,097
»	Thous. bush. of 60 lb.	31,520	35,161
Wheat flour	1000 centals	397	748
» »	Thous. bbl. of 196 lb.	203	382

(1) Export of coffee for 1941 amounts to 1,462,208,000 pounds.

PRICES

THE PRICES OF CEREALS OF THE 1941 CROP

In the following notes information will be found on the prices of cereals of the 1941 crop which was not yet available at the time of the publication of the August and September 1941 issues of the Crop Report (pp. 413-420 and 456-459 respectively). In a separate article (pp. 39-47) are given tables, as complete as possible, on the prices of the same cereals during the last three years.

Bulgaria.

Wheat and rye. — The Government has paid farmers a premium of 100 leva per quintal above the prices published in the Crop Report of August 1941. This premium was paid until October 30. New prices were fixed on October 31 and are still holding. They correspond to the old prices including premiums.

Maize. — The base price paid by the Direction for the Purchase and Exportation of Cereals which was set at 400 leva per quintal on September 5, 1941, has been reduced by 30 leva for the period November 1, 1941, to April 30, 1942. After that date it will be again 400 leva. Selling prices are established as follows:

Sales to the Army Service Corps and to the Bureau of Labour	500 leva per quintal
Sales to millers	510 ,, ,, ,,
Sales to wholesalers of Great Sofia	535 ,, ,, ,,
Sales to retailers of Great Sofia	600 ,, ,, ,,

Rice. — The selling price of millers, free at rice-mill, during the month of September was 2050 leva per quintal for rice " Pembe " and 1900 leva for the other qualities. Purchase prices free at the buyer's station, during the same month, were 2160 and 2010 leva respectively. These prices are increased by 10 leva per quintal and per month until and including the month of September 1942.

Croatia.

Maize. — The price to be paid to producers for shelled maize of the new crop, dried, with 16 per cent. humidity, has been fixed at 350 kunas per quintal, free at Mitrovica station. For maize having a higher degree of humidity, the

price is lower (minimum 280 kunas). Monthly increases have been fixed; they regard only maize not completely dry.

The price of unshelled maize is 210 kunas at the beginning and 280 kunas at the end of the season.

Spain.

Wheat. — In the Crop Report of September 1941, pp. 456-457, we indicated the supplement of 5 or 10 pesetas for wheat delivered to the Governmental Wheat Office before November 1 in certain regions and before December 1 in the remainder of the country. The supplement of 10 pesetas is given for wheat grown anywhere in Spain, except such zones of the Provinces of Badajoz, Huelva, Cadiz, Malaga, Granada and Jaen which were not inundated during the winter of 1940. In the latter zones the supplement amounts to 5 pesetas.

Rice. — According to an order of September 22, 1941, the price of raw rice to be paid free at producer's granery, for a dry, sound, well-cleaned product, has been increased, as compared with last year in the following measure:

Specification	1941-42 season	1940-41 season	1939-40 season
	pesetas per quintal		
Current quality rice produced in the regions of:			
Valencia, Castellon, Alicante, Murcia, Albacete, Gerona. .	91	81	[1]) 74
Ebro, Barcelona, Balearic Islands	90	79	[2]) 71
Andalusia	90	80	72
Special varieties: Bomba, Bombon and similar	135	121	95

[1]) All Spain, except the Province of Tarragona and Andalusia. — [2]) Province of Tarragona.

Prices are reduced by 1,25 pesetas per quintal for deliveries before November 15 in the regions of the Ebro, Barcelona and the Balearic Islands, and before October 18 in the other regions. Later it was decided that, above these prices, producers will receive a premium of 10 pesetas which is not calculated in the prices established for subsequent sales.

The selling price, f. o. r. rice-mill, for white rice, current quality, is fixed at 137 pesetas per quintal, without sacks. For rice of special qualities that are sold in sealed bags of 10 kg. with indication of quality, price etc., a scale has been fixed with a maximum of 233.50 pesetas per quintal. These prices are subject to an increase of 9 pesetas per quintal when sold by wholesalers and to a further increase of the same amount for sales by retailers.

Finland.

Wheat, rye, barley, oats. — In the September 1941 Crop Report (pp. 457-458) were mentioned prices of cereals of the new crop. These prices hold for the quantities that farmers are obliged to turn over to the Bureau of Victualling.

On quantities delivered above the obligatory amount, farmers will receive a supplement of 25 finmarks per quintal; as established by a decree of August 21. If on the contrary, within the period stipulated, the farmer does not offer the amount required by law, a requisition will be proceeded to against payment of a sum of 25 finmarks per quintal under the base price.

France.

Wheat, rye, barley, oats. — A number of decrees of the Chief of the French State, signed on August 10, 1941, and made legally effective beginning the 24th of the same month, has set the prices of cereals as follows:

Wheat, soft, metropolitan, 74 ½ to 75 ½ kg.	290 francs per quintal
Wheat, soft, Algerian, 75 ½ to 76 ½ kg.	290 " " "
Wheat, durum, 78 to 79 kg.	305 " " "
Rye, metropolitan, 69 ½ to 70 ½ kg.	245 " " "
Spring and winter barley, metropolitan, 68½ to 69½ kg.	230 " " "
Oats, metropolitan: grey or black, 49 ½ to 50 ½ kg.	215 " " "
Oats, metropolitan: white, yellow, variegated or all shades, 46 ½ to 47 ½ kg.	210 " " "

Among the sale conditions are the following: the merchandise must be sound and fair. In France prices refer to sales at the farm, while in Algeria they are for sales of wheat f. o. r. at Algerian quay.

Prices, in case of a specific weight different from that indicated for each of the products mentioned above, are subject to increases and reductions. As regards *wheat*, an increase of 1 franc is allowed on each ½ kg. when the specific weight is above that indicated, up to a maximum of 80 kg. for metropolitan soft wheat, a maximum of 82 kg. for Algerian soft wheat and a maximum of 83 kg. for durum wheat. Special regulations control the prices of wheat of a higher specific weight. A reduction of 1 franc is calculated for each ½ kg. when the specific weight is below that indicated, down to a minimum (in the three cases mentioned above) of 71 kg., 72 kg. and 70 kg. respectively. Bigger reductions are allowed on soft wheat of a lower specific weight. Wheat of a specific weight below 70 kg. is no longer considered as durum. At maximum 5 per cent. of broken kernels and 2 per cent. of other impurities are allowed. Reductions are applied in the case of higher percentages. Similar stipulations apply to the other cereals. For brewers' barley a maximum extra-premium of 10 francs per quintal may be allowed.

A statistical tax of 1 franc per quintal of wheat or rye is charged to the producer. Algerian wheat, besides being subject to the tax fore seen to cover wheat transport costs to France (provisionally set at 8 francs per quintal), is charged a tax of 12 francs per quintal, the proceeds of which are to be used to stabilise the price of bread and wheat products in Algeria. All these taxes are paid by the producer.

Metropolitan wheat producers will furthermore receive a delivery premium amounting to 11 francs per quintal. This premium is intended to compensate for threshing difficulties and to hasten deliveries. On the other hand 30 francs

per quintal will be paid less if the wheat is requisitioned after the period of legal delivery.

Also on barley and oats a statistical tax is charged. It amounts to 2 francs per quintal and is equally shared by producer and buyer.

A selling margin to the mill is calculated. On the other hand, the Treasury pays a compensating indemnity in order to prevent an increase in the price of bread. A selling margin is calculated also for barley and oats.

Between taxes, selling margins, and compensating indemnities, it results that prices actually paid to farmers and actually paid by millers during the year 1941-42 are as follows:

Specification	Price to producer	Price paid by miller
	francs per quintal	
Wheat, soft, metropolitan	300.00	211.70
Wheat, soft, Algerian	269.00	211.70
Wheat, durum, Algerian	284.00	...
Rye, metropolitan	244.00	179.55
Spring and winter barley	229.00	238.40
Oats, grey, etc.	214.00	223.25
Oats, white, etc.	209.00	218.25

Hungary.

Maize. — By a decree of the Commissioner for Price Control, dated September 28 and enforced the next day, prices to producers of maize of the new crop are established. The system of last year, which subdivided the country in 6 regions (later, including Hungarian Transylvania, in 9 regions) all with different prices, has been abolished. The base prices for the 1940 crop were for merchandise naturally dry, f.o.r. (on 15-ton car) or f.o.b. (barge). During May 1941, the percentage of humidity was not to be above 15. It has now been decreed that the percentage of humidity allowed is reduced each month. Prices and percentages of humidity appear from the following table:

Period	Unshelled maize	Shelled maize	Degree of humidity (1)
	Pengös per quintal		
September-October 1941	13.40	18.70	28
November "	14.60	19.70	25
December "	15.30	20.40	23.5
January 1942	16.00	21.00	22
February "	16.60	21.60	20.5
March "	17.10	22.20	19
April "	—	22.90	17
May "	—	23.50	15

(1) For unshelled maize: degree of humidity resulting in the grain after shelling.

For each per cent. of humidity above that indicated the price is reduced by 1 per cent. Selling prices by the licenced concerns "Hombar" and "Futura" are 1.50 pengo higher than those given above.

Italy.

Wheat, rye, barley, oats. — A Ministerial decree of December 30, 1941, fixes the latest date at which cereals must be delivered to collective warehouses ("ammassi collettivi") in order to receive the premiums for prompt delivery. This date, for soft and hard wheat, for rye, for barley and for oats has been established as February 28, 1942. The same decree fixes as March 31 the final date for delivery in order to avoid severe penal sanctions. Of this delivery only quantities legally recognised as necessary for domestic or farm consumption are exempt.

In September 1941, it was decided that a special supplement will be added to the price of early varieties of wheat of the 1942 production. This supplement will amount to 40 lire per quintal in Southern Italy, in Sicily and Sardinia, and to 20 lire in Northern and Central Italy. It is independent of the integrative supplement, premiums for prompt delivery and any other payment of whatever nature to which farmers may be entitled.

Rice. — All raw rice which is not kept aside for domestic or farm consumption according to the law, must be consigned to collective warehouses. For raw rice, sound, fair, of the 1941 crop, the following prices will be paid:

Current quality (Originario and similar varietes), yield 64 per cent.	146 lire per quintal
Qualities Bentivoglio, Piedmont and similar varieties, yield 60 per cent.	152 ,, ,, ,,
Semi-fine qualities (Maratelli, P 6 and similar varieties), yield 60 per cent.	156 ,, ,, ,,
Fine quality (Vialone and similar varieties), yield 56 per cent.	184 ,, ,, ,,
Superfine qualities, yield 45 or 53 per cent.	195 ,, ,, ,,

As from November 1, these prices are increased by 1 lira; as from November 16 a half-monthly supplement of 0.35 lira is given for covering warehouse expenses. The whole 1941 crop must be delivered not later than August 20, 1942.

The prices of white rice of the 1941-42 crop, f. o. r., ricemiller's station, in buyer's sacks, are:

Specification	Nov. 1 1941- Jan. 31 1942	Feb. 1- Apr. 30 1942	May 1- July 31 1942	Aug. 1- Oct. 31 1942
	lire per quintal			
Originario and similar varieties	182.80	184.80	186.80	188.80
Maratelli, P 6 and similar varieties	214.00	216.00	218.00	220.00
Vialone and similares varieties	279.30	281.30	283.30	285.30

Norway.

Cereals. — Prices published in the August 1941 Crop Report (p. 417) are base prices. In order to encourage early deliveries there are added to these prices 2,00 crowns per quintal during the period September 1 to 15. The increase is reduced to 1.50 crowns from September 16 to 30, and to 1 crown from the 1st to the 15th of October. Beginning October 16, prices paid are those previously published.

Portugal.

Maize. — At the beginning of the new season, the maximum price paid to producers for yellow or white continental maize of the new crop was the same as the price fixed on June 3, 1941, for maize of the 1940 production available at that date: i. e., 115 $ per quintal. Beginning January 1, 1942, and until the end of the season, this price is raised to 120 $.

Rice. — Prices of rice of the new crop have been fixed at practically the same level as they have been since 1936. They are given in the following table. Prices of raw rice are for sound, fair marchandise with a maximum impurity of 1.5 per cent and a specific weight of 9 kilos per 20 litres. For each 0.5 kg above that weight, the price will be increased by 2 escudos; the maximum price is fixed at 12 escudos more for a specific weight of 12 kilos per 20 litres. The merchandise is to be delivered f.o.r. grower's station or f.o.b. grower's port.

Price to be paid by retailers are f.o.r. or f.o.b. retailer's station or port if the rice factory is outside the retailer's municipality and at his shop or warehouse if the factory is within his municipality.

Quality	Raw Rice specific weight 9 kg. p. 20 litres	White Rice	
		Price to be paid by retailer	Price to be paid by consumer
	escudos per quintal		escudos per kg.
Carolina	125	324	3.60
Gigante 1st	123	266	3.00
Gigante 2nd	120	251	2.80
Mercantil	117	241	2.70
Current 1st (A, RR)	113	234	2.70
Current 2nd (AA)	101	209	2.30

From January 1 to April 30, 1942, prices to producers for raw rice will be increased by 1 escudo per quintal and per month.

Romania.

Wheat, rye, barley. — By a decree of November 17, 1941, the sale of barley is forbidden. Only mills and factories especially authorised, will be allowed to buy it. The authorisation will not be granted for fodder qualities.

The law of December 17, 1941, obliges farmers and some other categories of dealers to sell their wheat exclusively to the State. In addition to the official price (see Crop Report August 1941, p. 419, and Sept. 1941, p. 459) a premium for prompt delivery will be allowed in the case of deliveries before February 15, 1942. The amount of the premium is 200 lei per quintal of wheat and 150 lei per quintal of barley, including brewing barley.

Maize. — The Under-Secretary of State for Victualling, by a decree of November 11, 1941, which entered into force with retroactive effect as from November 10, has fixed the prices of maize according to the system of previous years. The base price of 900 lei per quintal refers to quality " Horse tooth ", with 16 degrees humidity and a maximum 3 per cent. of seeds affected by rust or otherwise damaged. It is free at shipping point near the place of production. It will be increased by 135 lei for " pignoletto " and " cinquantino " varieties, and by 90 lei for " hănganesc " variety having the same characteristics of humidity and impurity. The increases or reductions depending upon the percentage of humidity or of impurities, are 1 per cent. of the base price for each per cent. of humidity below or above 16 per cent. and for each per cent. of seeds affected by rust or otherwise deteriorated below or above 3 per cent.

Sweden.

Barley and oats. — Prices for delivery at the centres of the Swedish Cereal Company Ltd., before November 15, 1941, have been increased by 1 crown per quintal. Consequently they are: barley 27 crowns, white oats 23.50 crowns, black oats 22.50 crowns.

CEREAL PRICES IN CONTINENTAL EUROPE DURING THE LAST THREE YEARS

by

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In several numbers of this Crop Report we published the information which we have received on the prices of cereals of the 1940 and 1941 production. This information finds its completion, provisionally at least, in the notes published in this number at pp. 32-38 [1].

In the following tables we have made use of all this information and of other received later. We have also used analogous data relative to production of 1939, in order to establish the minimum, maximum or fixed prices to which farmers had or will have a right each month of the last two and of the current year. Official prices have been reduced of taxes etc., levied, or increased with premiums paid to farmers in as far as the information is available. Original prices which are not referring each year to a product having the same qualifications, have been reduced to a common quality, generally the base quality of the current season. In the comparatively rare cases in which governmental prices were not yet established, we have given free market prices.

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[1] Our readers will find the notes dealing with the different countries in the following numbers and pages of the Crop Report:

Germany: July 1940, p. 478; August 1941, p. 413.
Belgium: August 1941, p. 414.
Bulgaria: August 1941, p. 414; September 1941, p. 456; January 1942, p. 32.
Croatia: August 1941, p. 414; January 1942, p. 32.
Denmark: November 1940, pp. 697-698; August 1941, p. 415.
Spain: November 1940, pp. 698-699; September 1941, pp. 456-457; January 1942, p. 33.
Finland: September 1941, pp. 457-458; January 1942, pp. 33-34.
France: September 1940, p. 600; November 1940, p. 699; September 1941, p. 458; January 1942, pp. 34-35.
Greece: August 1941, p. 416; September 1941, p. 458.
Hungary: September 1940, p. 600; November 1940, pp. 699-700; August 1941, pp. 416-417; September 1941, p. 458; January 1942, p. 35.
Italy: September 1940, p. 601; May 1941, p. 252; August 1941, p. 417; January 1942, p. 36.
Norway: August 1941, p. 417; January 1942, p. 37.
Netherlands: December 1940, p. 755; May 1941, p. 252; August 1941, p. 418; September 1941, pp. 458-459.
Portugal: August 1941, pp. 418-419; January 1942, p. 37.
Romania: September 1940, pp. 601-602; November 1940, p. 700; August 1941, p. 419; September 1941, p. 459; January 1942, p. 38.
Serbia: August 1941, p. 419.
Sweden: August 1941, p. 420; January 1942, p. 38.
Switzerland: November 1940, p. 701; December 1940, p. 755; August 1941, p. 420.

It must be metioned however that these prices do not always represent the total sum cashed by the farmers for their cereal crops. In many cases sowing premiums should be added. As an example, we give here the following information:

Spain: A decree of October 6, 1940, establishes that farmers who, as a result of an increase of area sown to wheat in 1941, will offer a larger production than in 1940, will receive a premium of 5 pesetas per quintal of this additional quantity.

Italy: Thanks to a decree-law of October 10, 1941, a sowing premium of 200 lire will be paid to farmers for each ha sown to wheat, rye or barley.

Sweden: In the year 1942 a sowing premium is granted, amounting to 60 crowns per ha sown to wheat, and to 40 crowns for each ha sown to rye. The maximum amount that will be paid, however, will not be above 800 crowns per holding.

Switzerland: The Federal decree of the April 9 and the order of the Federal Council of May 23, 1939, concern the increase of areas under crops. According to the latter, a supplement is granted for crops in mountainous regions. The amount of this supplement which may be modified year by year, was, in 1939, 40 frs. per ha sown to oats, and 20 frs. per ha to barley or maize, if the domicile of the farmer is at between 800 and 900 m. of altitude, 50 and 30 frs. respectively if between 901 and 1000 m. of altitude, 60 and 40 frs. respectively if at between 1001 and 1100 m., and 75 and 50 frs. respectively if above 1100 m.

In the following notes we give some details relative to sale conditions of the different products as well as abstract tables indicating prices to be paid to farmers in the countries where no price change has taken place in the course of commercial year.

Germany. — Fixed prices paid to producers for a sound and merchantable product, available free at the station nearest to the producer's farm in the price region in which Berlin is situated. The specific weight per hectolitre is: wheat 75-77 kg., rye 70-72 kg., fodder barley 59-60 kg., and oats 46-48 kg.

Belgium. — July 1939-July 1940: price at the Antwerp market (for wheat July 1939-June 1940); subsequently maximum price to producers for cereals of good quality, sound, merchantable, delivered f. o. r. either at the nearest shipping point or at the warehouse of the agreed merchant or manufacturer in as far as this warehouse is not more distant than the producer's shipping point.

For spring and winter barley and for oats official prices to farmers have remained unchanged during the whole commercial season:

Spring and *winter barley*: 1940 crop, 150 francs; 1941 crop, 185 francs per quintal.

Oats: 1940 crop, 145 francs; 1941 crop, 180 francs per quintal.

Bulgaria. — Fixed prices paid to producers free at the warehouses of the Direction for the Purchase and Exportation of Cereals or free at authorised mills (for the 1941 crop: including premium).

Products	1941 crop	1940 crop	1939 crop
	leva per quintal		
Wheat, current quality, 76 kg. per hl.	620	430	350
Durum wheat, 77 kg. per hl.	630	450	380
White wheat, 76 kg. per hl.	630	430	350
Rye, 71 kg. per hl.	520	375	300
Barley, current quality	380	340	—
Barley, 2-rowed	410	360	—
Oats	400	360	—
Maize	500	300	250

Denmark. — July 1939-March 1940: prices at Köbenhavn market; April-August 1940: maximum prices to producers; subsenquenlty: fixed prices to producers.

These prices are for good quality product, sound, well cleaned, not mixed, sufficiently dry, with specific weight, expressed in Dutch pounds, as follows; wheat 128, rye 118, barley 112, oats 85. The cereals are to be delivered at merchant's warehouse, mill or depot of the Union for Concentrated Feedingstuffs or f.o.r. producer's station or on board in harbour.

Spain. — *Wheat, rye, barley, oats, maize:* Basic price to be paid to producers for fair, sound and well cleaned merchandise (wheat of « Arévalo " type and similar half-soft wheat, specific weight 77 kg., 3 per cent. impurities), in bulk, delivered at the Government Wheat Office's warehouses at Valladolid for wheat and fodder barley, at Léon for rye, and at Sevilla for the other cereals. Prices for delivery at other spots are slightly different.

Rice: Prices to producers of the province of Valencia for sound, dry, well cleaned, current quality merchandise free at producer's granary.

Finland. — Prices paid to farmers f. o. r. station of expedition. Prices given for the 1939 crop are maximum prices in force as from May 19, 1940, those for the 1940 crop minimum prices (for wheat fixed prices as from December 1), those for the 1941 crop fixed basic prices.

Products	1941 crop	1940 crop	1939 crop
	finmarks per quintal		
Winter wheat	340	294	290
Spring wheat	350	304	300
Rye	340	285	285
Barley	310	260	260
Oats	260	260	250

WHEAT — Producers prices.

(Figures in italics refers to market prices).

MONTHS	Germany RM. per 100 kg.	Belgium francs per 100 kg.	Denmark crowns per 100 kg.	Spain pesetas per 100 kg.	France francs per 100 kg.	Hungary pengös per 100 kg.	Italy lires per 100 kg.	Netherlands florins per 100 kg.	Portugal escudos per 100 kg.	Romania lei per 100 kg.	Sweden crowns per 100 kg.
July 1939..	(1) 19.40	*126.60*	*15.41*	59.00	195.25	19.75	135.00	10.75	154.85	361	*n. q.*
August » ..	19.60	*125.00*	*14.83*	59.00	196.75	19.75	135.00	10.90	143.15	420	*16.72*
September » ..	19.80	*120.40*	*18.75*	59.70	192.50	19.95	135.00	10.42	143.15	430	*17.07*
October » ..	20.00	*142.25*	*17.93*	60.40	194.00	20.15	135.00	10.56	144.45	440	*18.73*
November » ..	20.20	*142.00*	*18.32*	61.00	195.50	20.30	135.00	10.69	145.75	440	*19.93*
December » ..	20.40	*143.80*	*19.12*	61.60	197.00	20.75	135.00	10.81	147.05	450	*20.04*
January 1940..	20.60	*147.75*	*19.15*	62.10	198.50	20.55	135.00	10.95	148.35	420	*20.12*
February » ..	20.80	*151.25*	*19.18*	62.60	200.00	20.65	135.00	11.08	149.65	420	*20.42*
March » ..	21.00	*158.40*	*19.12*	63.00	201.50	20.75	135.00	11.20	150.95	420	*20.63*
April » ..	21.20	*156.00*	18.60	63.40	203.00	20.75	135.00	11.35	152.25	420	*21.08*
May » ..	21.40	* *159.00*	18.70	63.70	204.50	20.75	135.00	11.47	153.55	420	*21.40*
June » ..	21.60	*n. q.*	18.80	64.00	206.00	20.75	155.00	11.60	154.85	420	21.50
July 1940..	(1) 19.40	171.00	18.90	84.00	207.50	(4) 25.50	155.00	11.74	154.85	420	21.50
August » ..	19.60	170.00	19.00	84.00	209.00	25.50	155.00	11.86	143.15	687	*24.25*
September » ..	19.80	170.00	28.00	84.00	214.75	25.70	155.00	11.54	143.15	757	*25.02*
October » ..	20.00	170.00	28.00	84.00	216.75	25.90	155.00	11.68	144.45	857	* 27.00
November » ..	20.20	170.00	28.00	84.00	218.75	26.05	155.00	11.81	145.75	857	27.00
December » ..	20.40	170.00	28.00	84.00	226.75	26.20	155.00	11.93	147.05	857	27.00
January 1941..	20.60	170.00	28.00	83.50	229.75	26.30	155.00	12.07	148.35	857	27.00
February » ..	20.80	170.00	28.00	83.50	229.75	26.40	155.00	12.20	149.65	857	25.00
March » ..	21.00	170.00	28.00	83.50	229.75	26.50	155.00	12.32	150.95	857	25.00
April » ..	21.20	170.00	28.00	83.00	n. 229.75	26.50	155.00	12.45	152.25	857	25.00
May » ..	21.40	170.00	28.00	83.00	n. 229.75	n. 24.00	155.00	12.49	153.55	857	25.00
June » ..	21.60	170.00	28.00	83.00	n. 229.75	n. 24.00	190.00	12.49	154.85	857	n. q.
July 1941..	(1) 19.40	170.00	28.00	83.00	n. 229.75	(4) 30.00	175.00	12.49	154.85	1,100	n. q.
August » ..	20.40	220.00	28.00	(1) 94.00	(3) 300.00	30.00	175.00	12.49	163.15	1,100	27.00
September » ..	20.40	220.00	28.00	94.00	300.00	30.00	175.00	13.57	163.15	1,100	27.00
October » ..	20.40	212.00	28.00	94.00	300.00	30.00	175.00	13.64	164.45	1,100	27.00
November » ..	20.40	210.00	28.00	94.00	300.00	27.00	175.00	13.71	165.75	1,100	27.00
December » ..	20.60	205.00	28.00	84.00	300.00	27.00	175.00	13.47	167.05	1,170	27.00
January 1942..	20.80	201.00	28.00	83.00	300.00	27.00	175.00	13.54	168.35	1,300	27.00
February » ..	21.00	200.00	28.00	83.00	300.00	27.00	175.00	13.60	169.65	1,200	27.00
March » ..	21.00	200.00	28.00	n. q.	300.00	27.00	n. 155.00	13.62	170.95	1,100	n. q.
April » ..	20.80	200.00	28.00	n. q.	n. 270.00	27.00	n. q.	13.62	172.25	1,100	n. q
May » ..	20.80	200.00	28.00	n. q.	n. 270.00	27.00	n. q.	13.62	173.55	1,100	n. q.
June » ..	20.60	200.00	28.00	n. q.	n. 270.00	27.00	...	13.62	174.85	1,100	n. q.
July 1942..	(2) 20.60	200.00	28.00	...	n. 270.00	...	...	13.62	174.85	...	n. q.
August » ..	...	...	28.00	...	...	...	...	13.62	...	...	...

(*) Indicates that prices refers only to a part of the month. — (1) New crop; second half of the month. — (2) First half of the month. — (3) New crop, as from August 24. — (4) New crop; end of the month.

France. — Prices refer to sales at the agricultural holding. Reduction has been made of taxes and levies paid by the farmer; in cases where premiums are given they have been added. Prices refer to a sound and fair product with following specific weight: wheat 74 ½-75 ½ kg., rye 69 ½-70 ½ kg., barley 68 ½-69 ½ kg., grey or black oats 49 ½-50 ½ kg.

Hungary. — 1939 crop: wheat: prices to producers; rye and barley: July December 1939 prices at Budapest market, subsequently prices to producers; oats and maize: prices at Budapest market.

RYE — Producers prices.

(Figures in italics refers to market prices).

Months	Germany RM. per 100 kg.	Belgium francs per 100 kg.	Denmark crowns per 100 kg.	Spain pesetas per 100 kg.	France francs per 100 kg.	Hungary pengös per 100 kg.	Italy lires per 100 kg.	Netherlands florins per 100 kg.	Portugal escudos per 100 kg.	Romania lei per 100 kg.	Sweden crowns per 100 kg
July 1939..	17.70	*n. q.*	*15.37*	...	*104.00*	*13.36*	*112.25*	*8.65*	*111.20*	*274*	*n. q.*
August » ..	17.90	*n. q.*	* *14.12*	...	*92.00*	*14.20*	*112.70*	* *6.86*	*111.20*	*277*	*15.81*
September » ..	18.10	*n. q.*	* *19.75*	...	*n. q.*	*14.12*	*117.80*	9.00	*111.20*	*319*	*16.48*
October » ..	18.30	* *123.50*	*20.19*	...	* *97.00*	*14.11*	*121.00*	9.00	*111.20*	*341*	*18.23*
November » ..	18.50	*116.25*	*20.39*	...	*102.00*	*14.71*	*121.25*	9.00	*111.20*	*350*	*19.87*
December » ..	18.70	* *115.35*	19.20	...	*136.00*	*15.26*	*121.35*	9.02	*111.20*	*380*	*20.09*
January 1940..	18.90	*n. q.*	19.30	...	*154.00*	15.82	*128.75*	9.15	*111.20*	*400*	*20.27*
February » ..	19.10	*133.50*	19.40	...	*156.00*	16.12	*133.50*	9.29	*111.20*	*488*	*20.49*
March » ..	19.30	*143.60*	19.50	...	*151.00*	16.42	*133.50*	9.41	*111.20*	*515*	*20.69*
April » ..	19.50	*140.50*	19.60	...	*145.00*	16.57	*133.45*	9.55	*111.20*	*585*	*21.09*
May » ..	19.70	* *137.00*	19.70	...	*138.00*	16.72	*136.00*	9.73	*111.20*	*606*	*21.42*
June » ..	19.90	*n. q.*	19.80	...	*n. q.*	16.72	*136.00*	9.91	*111.20*	*640*	21.50
July 1940..	17.70	n. q.	19.90	70.00	n. q.	(1) 19.00	*136.00*	10.07	*111.20*	*560*	21.50
August » ..	17.90	155.00	* 20.00	70.00	n. q.	19.00	*136.00*	10.25	*111.20*	520	*24.16*
September » ..	18.10	155.00	29.00	70.00	171.00	19.20	*136.00*	10.54	*111.20*	520	*24.91*
October » ..	18.30	155.00	29.00	70.00	172.00	19.40	*136.00*	10.68	*111.20*	530	* 27.00
November » ..	18.50	155.00	29.00	70.00	173.00	19.55	*136.00*	10.81	*111.20*	700	27.00
December » ..	18.70	155.00	29.00	70.00	174.00	19.70	*136.00*	10.93	*111.20*	700	27.00
January 1941..	18.90	155.00	29.00	69.50	175.00	19.80	*136.00*	11.07	*111.20*	700	27.00
February » ..	19.10	155.00	29.00	69.50	176.00	19.90	*136.00*	11.20	*111.20*	700	25.00
March » ..	19.30	155.00	29.00	69.50	177.00	20.00	*136.00*	11.32	*111.20*	700	25.00
April » ..	19.50	155.00	29.00	69.00	178.00	20.00	*136.00*	11.45	*111.20*	700	25.00
May » ..	19.70	155.00	29.00	69.00	179.00	20.00	*136.00*	11.49	*111.20*	700	25.00
June » ..	19.90	155.00	29.00	69.00	180.00	20.00	*136.00*	11.49	*111.20*	700	n. q.
July 1941..	17.70	155.00	29.00	70.00	181.00	(1) 28.00	166.00	11.49	113.10	700	n. q.
August » ..	18.70	210.00	29.00	70.00	182.00	28.00	166.00	11.49	113.10	900	27.00
September » ..	18.70	210.00	29.00	70.00	244.00	28.00	166.00	13.07	113.10	900	27.00
October » ..	18.70	202.00	29.00	70.00	244.00	28.00	166.00	13.14	114.40	900	27.00
November » ..	18.70	200.00	29.00	70.00	244.00	25.20	166.00	13.21	115.70	900	27.00
December » ..	18.90	195.00	29.00	70.00	244.00	25.20	166.00	12.97	117.00	900	27.00
January 1942..	19.10	191.00	29.00	69.00	244.00	25.20	166.00	13.04	118.30	900	27.00
February » ..	19.30	190.00	29.00	69.00	244.00	25.20	* 150.00	13.10	119.60	900	27.00
March » ..	19.30	190.00	29.00	n. q.	244.00	25.20	n. q.	13.12	120.90	900	n. q.
April » ..	19.10	190.00	29.00	n. q.	244.00	25.20	n. q.	13.12	122.20	900	n. q.
May » ..	18.70	190.00	29.00	n. q.	244.00	25.20	n. q.	13.12	123.50	900	n. q.
June » ..	18.70	190.00	29.00	n. q.	244.00	25.20	n. q.	13.12	124.80	900	n. q.
July 1942..	...	190.00	29.00	...	244.00	...	n. q.	13.12	...	...	n. q.
August » ..	...	...	29.00	...	...	...	...	13.12	...	...	...

* Indicates that prices refers only to a part of the month. — (1) New crop, end of the month.

1940 crop: prices to producers. Wheat, rye, barley and oats: f. o. r. all stations of the country; maize: f. o. r. Budapest stations.

1941 crop: prices to producers. Wheat, rye and maize: f. o. r. all stations of the country; barley and oats: f. o. r. Budapest stations.

Wheat: merchantable quality, specific weight 78 kg. (1940 crop: 76 kg.).

Rye: merchantable quality, specific weight 71 kg.

Fodder barley: 1st quality, specific weight at least 65 kg.

Fodder oats: specific weight at least 41 kg.

Maize: sound, naturally dry, base 15 per cent. humidity during May.

FODDER BARLEY — Producers prices.

(Figures in italics refers to market prices).

Months	Germany RM. per 100 kg.	Denmark crowns per 100 kg.	Spain pesetas per 100 kg.	France francs per 100 kg.	Hungary pengös per 100 kg.	Italy lires per 100 gk.	Netherlands (1) florins per 100 kg.	Romania lei per 100 kg.	Sweden crowns per 100 kg.
July 1939......	16.20	*11.75*	...	*96.30*	*n. q.*	*122.50*	*n. q.*	* *307*	*n. q.*
August »	16.40	*11.97*	...	* *92.00*	*16.95*	*122.50*	* *7.73*	*286*	*13.63*
September »	16.60	*16.75*	...	*n. q.*	*16.80*	*124.05*	9.00	*325*	*14.31*
October »	16.80	* *16.93*	...	* *97.00*	*16.80*	*125.00*	9.00	*367*	*16.87*
November »	17.00	*17.81*	...	*116.00*	*17.52*	*125.00*	9.00	*416*	*17.50*
December »	17.20	* *18.19*	...	*124.00*	*17.72*	*130.60*	9.00	*420*	*17.73*
January 1940......	17.40	17.30	...	*134.00*	17.92	*140.00*	9.00	*420*	*17.68*
February »	17.60	17.40	...	*130.00*	18.22	*140.00*	9.00	*420*	*17.75*
March »	17.70	17.50	...	*123.00*	18.42	*140.00*	9.00	*420*	*n. q.*
April »	17.80	17.60	...	*119.00*	18.62	*141.85*	9.00	*455*	*n. q.*
May »	19.90	17.70	...	*116.00*	18.72	*145.00*	9.00	*458*	*n. q.*
June »	18.00	17.80	...	*n. q.*	18.72	*145.00*	9.00	*n. q.*	*n. q.*
July 1940......	16.20	17.90	56.50	n. q.	(2) 20.00	*145.30*	9.00	n. q.	*n. q.*
August »	16.40	18.00	56.50	n. q.	20.00	*147.50*	9.00	396	*n. q.*
September »	16.60	25.00	56.50	160.00	20.25	*147.50*	10.04	396	*25.00*
October »	16.80	25.00	56.50	161.00	20.70	130.00	10.18	406	*25.76*
November »	17.00	25.00	56.50	162.00	21.00	130.00	10.31	510	25.00
December »	17.20	25.00	56.50	163.00	21.20	130.00	10.43	510	25.00
January 1941......	17.40	25.00	56.00	164.00	21.40	130.00	10.57	510	25.00
February »	17.60	25.00	56.00	165.00	21.60	130.00	10.70	510	25.00
March »	17.70	25.00	56.00	166.00	21.80	130.00	10.82	510	23.00
April »	17.80	25.00	55.50	167.00	22.00	130.00	10.95	510	23.00
May »	17.90	25.00	55.50	168.00	22.00	130.00	10.99	510	23.00
June »	18.00	25.00	55.50	169.00	22.00	130.00	10.99	510	n. q.
July 1941......	16.20	25.00	51.50	170.00	(2) 24.50	161.00	10.99	510	n. q.
August »	16.40	25.00	51.50	171.00	24.50	161.00	10.99	750	27.00
September »	16.60	25.00	51.50	229.00	24.50	161.00	11.82	750	27.00
October »	16.80	25.00	51.50	229.00	24.50	161.00	11.89	750	27.00
November »	17.00	25.00	51.50	229.00	24.50	161.00	11.96	* 750	26.50
December »	17.20	25.00	51.50	229.00	24.50	161.00	11.72	* 900	26.00
January 1942......	17.40	25.00	50.50	229.00	24.50	161.00	11.79	900	26.00
February »	17.60	25.00	50.50	229.00	24.50	* 145.00	11.85	825	26.00
March »	17.70	25.00	n. q.	229.00	24.50	n. q.	11.87	750	n. q.
April »	17.80	25.00	n. q.	229.00	24.50	n. q.	11.87	750	n. q.
May »	17.90	25.00	n. q.	229.00	24.50	n. q.	11.87	750	n. q.
June »	18.00	25.00	n. q.	229.00	24.50	n. q.	11.87	750	n. q.
July 1942......	...	25.00	...	229.00	...	...	11.87	...	n. q.
August »	...	25.00	...	...	...	...	11.87	...	...

* Indicates that prices refers only to a part of the month. — (1) Winter barley. — (2) New crop, end of the month.

Italy. — *Soft wheat:* good merchantable quality, specific weight 75 kg., 1 per cent. impurities; prices to producers free at collective depot. *Durum wheat;* same conditions (specific weight 78 kg.); prices per quintal are 15 lire higher than for soft wheat.

Rye: good merchantable quality, specific weight 68 kg., 1 per cent. impurities. 1939 and 1940 crops: prices at Milan market; 1941 crop: prices paid to producers, free at collective depot.

OATS — Producers prices.

(Figures in italics refers to market prices).

Months	Germany RM. per 100 kg.	Denmark crowns per 100 kg.	Spain pesetas per 100 kg.	France (4) francs per 100 kg.	Hungary pengös per 100 kg.	Italy lires per 100 kg.	Netherlands florins per 100 kg.	Romania lei per 100 kg.	Sweden (5) crowns per 100 kg.
July 1939	18.10	*12.89*	...	*66.70*	*n. q.*	*102.50*	* *7.45*	*445*	*n. q.*
August »	1) 17.10	*12.56*	...	*62.40*	*20.35*	*103.50*	* *6.86*	*407*	*n. q.*
September »	17.20	*17.75*	...	*n. q.*	*19.22*	*107.50*	8.00	*402*	*13.21*
October »	17.30	*17.56*	...	* *69.00*	*19.12*	*107.50*	8.00	*410*	*14.15*
November »	17.40	*18.37*	...	*83.00*	*19.37*	*107.50*	8.00	*443*	*14.98*
December »	17.50	* *19.15*	...	*87.00*	*19.82*	*134.15*	8.00	*467*	*15.26*
January 1940	17.60	17.30	...	*97.00*	*20.10*	*147.50*	8.00	*507*	*15.61*
February »	17.70	17.40	...	*97.00*	*20.60*	*147.50*	8.00	*532*	*16.73*
March »	17.80	17.50	...	*96.00*	*20.80*	*147.50*	8.00	*565*	*17.48*
April »	17.90	17.60	...	*100.00*	*20.80*	*151.25*	8.00	*590*	*18.45*
May »	18.00	17.70	...	*103.00*	*21.10*	*162.50*	8.00	*661*	*19.44*
June »	18.10	17.80	...	*n. q.*	*21.10*	*162.50*	8.00	*669*	*n. q.*
July 1940	18.10	17.90	48.50	n. q.	3) 20.70	135.00	8.00	*653*	n. q.
August »	1) 17.80	18.00	48.50	n. q.	21.10	135.00	8.00	412	n. q.
September »	17.90	25.00	48.50	145.00	21.50	135.00	8.54	412	*22.73*
October »	18.00	25.00	48.50	146.00	21.90	135.00	8.68	422	*23.66*
November »	18.10	25.00	48.50	147.00	21.20	135.00	8.81	530	22.50
December »	18.20	25.00	48.50	148.00	21.45	135.00	8.93	530	22.50
January 1941	18.30	25.00	48.00	149.00	21.70	135.00	9.07	530	22.50
February »	18.40	25.00	48.00	150.00	21.90	135.00	9.20	530	22.50
March »	18.50	25.00	48.00	151.00	22.10	135.00	9.32	530	21.50
April »	18.60	25.00	47.50	152.00	22.30	135.00	9.45	530	21.50
May »	18.70	25.00	47.50	153.00	22.50	135.00	9.49	530	21.50
June »	18.80	25.00	47.50	154.00	22.70	135.00	9.49	530	n. q.
July 1941	18.80	25.00	48.50	155.00	26.50	151.00	9.49	530	n. q.
August »	1) 17.80	25.00	48.50	156.00	26.50	151.00	9.49	700	23.50
September »	17.90	25.00	48.50	214.00	26.50	151.00	9.82	700	23.50
October »	18.00	25.00	48.50	214.00	26.50	151.00	9.89	700	23.50
November »	18.10	25.00	48.50	214.00	26.50	151.00	9.96	700	23.00
December »	18.20	25.00	48.50	214.00	26.50	143.00	9.72	700	22.50
January 1942	18.30	25.00	47.50	214.00	26.50	n. q.	9.79	700	22.50
February »	18.40	25.00	47.50	214.00	26.50	n. q.	9.85	700	22.50
March »	18.50	25.00	n. q.	214.00	26.50	n. q.	9.87	700	n. q.
April »	18.60	25.00	n. q.	214.00	26.50	n. q.	9.87	700	n. q.
May »	18.70	25.00	n. q.	214.00	26.50	n. q.	9.87	700	n. q.
June »	18.80	25.00	n. q.	214.00	26.50	n. q.	9.87	700	n. q.
July 1942	18.80	25.00	...	214.00	...	n. q.	9.87	700	n. q.
August »	2) 18.80	25.00	...	214.00	...	n. q.	9.87	700	...

* Indicates that prices refers only to a part of the month. — (1) New crop, second half of the month — (2) First half of the month. — (3) New crop, end of the month. — (4) Grey or blak oats. — (5) White oats.

Barley: current quality, sound, dry, merchantable, specific weight 56 kg., 2 per cent. impurities. 1939 crop and beginning 1940 crop: prices at Milan market; 1940 crop as from end September: maximum prices f. o. r. producer's station; 1941 crop: prices paid to producers, free at collective depot.

Oats: current quality, sound, dry, merchantable, specific weight 42 kg., 1 per cent. impurities. 1939 crop: prices at Milan market; 1940 and 1941 crops: prices to producers, free at collective depot.

MAIZE and RAW RICE — Producers prices.

(Figures in italics refers to market prices).

Months	Maize					Raw Rice		
	Spain pesetas per 100 kg.	Hungary pengös per 100 kg.	Italy lires per 100 kg.	Portugal escudos per 100 kg.	Romania lei per 100 kg.	Spain pesetas per 100 kg.	Italy lires per 100 kg.	Portugal escudos per 100 kg.
July 1939	...	*18.05*	n. q.	*104.25*	*400*	...	...	...
August »	52.47	*19.57*	n. q.	*104.25*	*410*	...	109.00	...
September »	53.16	*18.85*	n. q.	*104.25*	*357*	...	109.00	...
October »	53.86	*19.25*	n. q.	*104.25*	*292*	...	103.00	...
November »	54.45	*17.27*	108.00	*104.25*	*323*	...	103.00	...
December »	54.95	*19.62*	108.00	*104.25*	*291*	...	104.00	...
January 1940	55.44	*20.67*	108.00	*104.25*	*341*	...	105.00	...
February »	55.84	*21.35*	108.00	*104.25*	*352*	...	105.00	...
March »	56.23	*21.46*	108.00	*104.25*	*368*	...	106.00	...
April »	56.63	*22.35*	108.00	*104.25*	*434*	...	107.00	...
May »	57.02	*23.00*	108.00	*104.25*	*525*	...	107.00	...
June »	57.42	*26.75*	108.00	*104.25*	*516*	...	108.00	...
July 1940	57.42	*n. q.*	108.00	*104.25*	*517*	...	109.00	...
August »	70.00	*n. q.*	108.00	*104.25*	*517*	...	109.00	...
September »	70.00	*n. q.*	120.00	114.80	480	* 79.75	109.00	...
October »	70.00	17.50	120.00	114.80	480	80.15	140.00	...
November »	70.00	19.10	120.00	114.80	520	81.00	140.00	...
December »	70.00	19.90	120.00	114.80	520	81.00	140.00	...
January 1941	69.50	20.60	120.00	114.80	520	81.00	142.00	...
February »	69.50	21.30	120.00	114.80	520	81.00	142.00	...
March »	69.50	22.10	120.00	114.80	520	81.00	142.00	...
April »	69.00	22.80	120.00	114.80	520	81.00	144.00	...
May »	69.00	21.80	120.00	114.80	570	81.00	144.00	...
June »	69.00	21.20	120.00	115.00	720	81.00	144.00	...
July 1941	69.00	21.20	120.00	115.00	720	81.00	146.00	...
August »	70.00	21.20	120.00	115.00	720	81.00	* 146.00	...
September »	70.00	18.70	135.00	115.00	720	* 99.75	n. q.	...
October »	70.00	18.70	135.00	115.00	720	100.20	156.00	...
November »	70.00	19.70	135.00	115.00	840	101.00	157.15	117.00
December »	70.00	20.40	135.00	115.00	900	101.00	157.85	117.00
January 1942	69.00	21.00	135.00	120.00	900	101.00	158.55	118.00
February »	69.00	21.60	135.00	120.00	900	101.00	159.25	119.00
March »	n. q.	22.20	120.00	120.00	900	101.00	159.95	120.00
April »	n. q.	22.90	n. q.	120.00	900	101.00	160.65	121.00
May »	n. q.	23.50	n. q.	120.00	900	101.00	161.35	121.00
June »	n. q.	23.50	n. q.	120.00	900	101.00	162.05	121.00
July 1942	n. q.	23.50	n. q.	120.00	900	101.00	162.75	121.00
August »	n. q.	23.50	n. q.	120.00	900	101.00	* 162.85	121.00

* Indicates that prices refers only to a part of the month.

Maize: current quality, sound, fair, merchantable, 16 per cent. humidity; prices to producers, free at collective depot.

Raw rice: prices paid to producers, free at collective depot, for Maratelli and similar varieties, sound, fair, merchantable.

Netherlands. — *Wheat:* fixed prices paid to producers.

Rye, barley, oats: July-August 1939: prices at Groningen market; subsequently: prices paid to producers.

Portugal. — *Wheat:* fixed prices paid to producers for merchantable wheat delivered free at producer's port or station, specific weight 77 kg., with at maximum 2 per cent. impurities.

Rye: July 1939-July 1940, average price at all the markets of Continental Portugal; subsequently, fixed prices paid to producers, free at the depots of the National Union of Wheat Producers. The latter price is for rye with specific weight 72 kg. and at maximum 3 per cent. impurities.

Maize: July 1939-July 1940, average price at all the markets of Continental Portugal, August 1940-May 1941, sale price of the National Union of Wheat Producers to millers; subsequently, maximum price to producers. The latter price refers to yellow or white maize, sound, fair, naturally dry.

Raw rice: f.o.r. producer's station or f.o.b. producer's port for Mercantil variety, specific weight 9 kg. per 20 litres, sound, fair, with at maximum 1 ½ per cent. impurities.

Romania. — 1939 crop: for wheat minimum price paid to producers; for barley and maize price at Braila market; for rye July-December 1939 price at Braila market, January-June 1940 price at Costanţa market, July 1940 average price for home consumption; for oats average price for home consumption. Subsequently for all cereals prices paid to producers.

The prices paid to producers are for delivery free at producer's station or quay, further qualifications being: (*a*) specific weight: wheat 75 kg., rye 68 kg., barley 60 kg., oats 42 kg.; (*b*) maximum of impurities: wheat and rye 3 per cent., barley and oats 4 per cent.; (*c*) horse tooth maize: 16 per cent. humidity, at maximum 3 per cent. of seeds affected by rust or otherwise deteriorated.

Sweden. — *Wheat and rye*: August 1939-May 1940 and August – end October 1940, prices at Stockholm market; during the other periods, prices paid to producers. Prices of June and July 1940, of end October 1940-January 1941 and of August 1941 – February 1942 are for produce offered to the Swedish Cereal Company Ltd. before May 15, 1940; February 1, 1941, and March 1, 1942, respectively.

Barley and oats: before end October 1940, prices at Stockholm market; subsequently, prices to producers. Prices of end October 1940 – February 1941 and of August 1941 – February 1942 are for produce offered to the said Cereal Company before March 1, 1941, and 1942, respectively.

Switzerland. — Prices of bread cereals have been fixed for a long period already. Prices of barley, oats and maize of the 1940 and 1941 crops have also

Products	1941 crop	1940 crop	1939 crop
	francs per quintal		
Wheat	45.50	42.00	36.00
Rye	43.50	39.00	28.50
Fodder barley	40.50	38.00	—
Fodder oats	40.00	37.00	—
Maize	43.00	40.00	—

been fixed. They refer to marchandise delivered at the station of expedition or to a mill or depot in the neighbourhood of the agricultural holding; specific weight: wheat 77-78 kg., rye 71-72 kg., fodder barley 61-65 kg., fodder oats 46-47 kg.; the wheat is of type I (Montcalme).

NEW YORK SUGAR PRICES IN 1941

Among the sugar markets which, one after the other, have ceased operating during the war (and some even before hostilities began), the only one that continued functioning in 1941 was the New York market whose paramount influence is felt far beyond the frontiers of the country. This is an important fact, as in a certain number of countries sugar statistics are no longer published and prices are often fixed by the Government.

Naturally, in this conflict which involves all continents, the New York market nowdays has no longer the importance it had in the past and its quotations no longer influence the other markets. But, even though it does not rule, it at least continues to influence the quotations of the two Americas, which, from the point of view of sugar production and consumption still represent more than 30 per cent. of world total.

One cannot speak any more of a complete freedom of quotations in the United States, since the Government controls the sugar policy and has reserved its right to regulate the quantities of sugar allowed for consumers' needs. But the action of the Government is not continuous and it manifests itself chiefly when, in its opinion, speculation is likely to create abnormal market conditions. It can be said, therefore, that, within certain limits, prices have been free to adapt themselves during most of the year to present circumstances. An analysis of the prices of sugar on the New York market may still be interesting from an international viewpoint.

After a year during which prices on the New York market seemed not to be appreciably affected by the war, the year 1941 started with a slight tendency to a rise. This tendency began after the Secretary for Agriculture announced, on August 26, 1940 a reduction of sugar quantities allowed for consumption, and continued, with some oscillations, till the end of that year. Prices went on slowly rising until the third decade of February 1941, when they went sharply up owing to the fact that the scarcity of tonnage had begun to cause a certain rise in freight charges.

From the beginning of the war until the end of February 1941, the movements of sugar prices at New York had been contained within very narrow limits, because the rise which might have been favoured by shipping difficulties, was on the other side neutralised by the gradual closing of sugar importing markets in proportion to the German occupation of new European countries. Outlets for American sugar became unavailable one after the other.

But at the end of February 1941 the lack of tonnage became so acute as to cause an increase of freight charges even for as short a voyage as that between Cuba and the United States. Transportation difficulties went on increasing, until, at the end of March the United States Maritime Commission's Division of Emergency Shipping forbade leasing to foreigners American ships destined to the transportation of material and merchandise needed for national defence. This measure however did not curb prices which are irresistibly rising. Sea transports are of capital importance for all countries, and at present they are the more so for the United States which not only must provide for their own national needs, but must also attend to the supplying of the United Kingdom. As regards sugar, almost two thirds of it that are requisitioned for home consumption, come from overseas: mostly from Cuba, Puerto Rico, the Philippines, Hawaii and Virgin Islands. This is enough to give an idea of present difficulties.

Sugar prices 1941 in New York.

Date	Cuba centrifugals 96° without duty prompt shipment cents per lb.	Date	Cuba centrifugals 96° without duty prompt shipment cents per lb.	Date	Cuba centrifugals 96° without duty prompt shipment cents per lb.
January 2, 1941 . .	2.00	May 1, 1941 . . .	2.40	September 4, 1941 .	2.60
» 9, » . .	2.03	» 8, » . . .	2.55	» 11, » .	2.60
» 16, » . .	2.03	» 15, » . . .	2.48	» 18, » .	2.60
» 23, » . .	2.03	» 22, » . . .	2.45	» 25, » .	2.60
» 30, » . .	2.04	» 29, » . . .	2.52	October 2, » .	2.60
February 6, » . .	2.04	June 5, » . . .	2.55	» 9, » .	2.60
» 13, » . .	2.07	» 12, » . . .	2.60	» 16, » .	2.60
» 20, » . .	2.10	» 19, » . . .	2.60	» 23, » .	2.60
» 27, » . .	2.20	» 26, » . . .	2.60	» 30, » .	2.60
March 6, » . .	2.25	July 3, » . . .	2.60	November 6, » .	2.60
» 13, » . .	2.35	» 10, » . . .	2.55	» 13, » .	2.60
» 20, » . .	2.45	» 17, » . . .	2.55	» 19, » .	2.60
» 27, » . .	2.55	» 24, » . . .	2.65	» 27, » .	...
April 3, » . .	2.50	» 31, » . . .	2.75	December 4, » .	...
» 10, » . .	2.50	August 7, » . . .	2.85	» 11, » .	...
» 17, » . .	2.50	» 14, » . . .	2.90	» 18, » .	...
» 24, » . .	2.40	» 21, » . . .	2.90	» 26, » .	...
		» 28, » . . .	2.90		

In April a slight improvement in sugar quotations was registered, due perhaps to press news about a probable increase of the beet and sugar cane area contemplated by the Department of Agriculture, and the eventual creation of a bureau for the regulation and control of prices. But in May the real situation of the market, with all its unsurmountable difficulties, caused again a rise of sugar prices which continued until the month of August, when they reached the maximum level of the year. During that period to the uneasiness that goes with a rise of prices, were added many secondary though very important factors which contributed to upset the market. Among such factors may be mentioned the authorisation given in May to the Maritime Commission to control more strictly the shipping movements in the interest of national defense, and

to grant preferential warrants to ships whose owners were ready to accept the conditions imposed by the same Commission as to destination, ports, nature of cargoes, etc. At the end of May followed the declaration of a state of national emergency. At the beginning of July the Japanese Government withdrew its ships from the Philippine service. Yet, in spite of these alarming elements, quotations continued to hold well and did not lose one single point, even when at the end of July the Department of Agriculture increased considerably the quantities allowed for consumption up to 500,000 sh. tons.

But at the bottom of the troubles which disturb the market and continue to influence prices, there are two principal factors whose effects are not clearly revealed. One is constituted by periodical purchases made by the United Kingdom in the United States, or in the countries that supply them, which are not always known to the United States themselves. The other is constituted by retail purchases which multiply in the most unexpected way in proportion to the increased menace of political events. As it happens with consumers everywhere in these times of uncertainty, Americans, who are among the biggest sugar consumers, buy as much sugar as they can get hold of, thus totalling very high quantities whose amount has been revealed by an exceptional increase of imports.

Altogether, in August quotations had risen to levels which were considered exaggerated by responsible authorities. In order to safeguard the people from unlawful speculations, the *Office of Price Administration and Civilian Supply* (Opacs) fixed a maximum price which has stood till the end of the year.

Thus also the only quotations that had remained free till very recently, had to submit, at least for the time being, to war conditions.

E. R.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	Jan. 16, 1942	Jan. 9, 1942	Jan. 2, 1942	Dec. 27, 1941	Dec. 19, 1941	Monthly averages: Dec. 1941	Jan. 1941	Jan. 1940	Jan. 1939	Jan. 1938
Wheat.										
Winnipeg (cents p. 60 lb.):										
delivery December	—	—	—	74 1/8	74	74 1/4	—	—	—	—
„ May	79 1/2	79	78	77 3/8	77 3/4	77 7/8	77 1/4	86 1/4	62 3/4	126 1/8
„ July	80 5/8	80 1/8	79 1/8	78 5/8	79	79 1/8	78 7/8	87	63 3/8	118 3/8
„ October	—	—	—	—	—	—	—	88 1/4	63 5/8	99 7/8
Chicago (cents. p. 60 lb):										
delivery December	—	—	—	—	122 7/8	* 122 3/8	—	—	—*	—
„ May	130 7/8	128 7/8	128 1/8	126 1/2	125 1/2	126 1/8	86	100 5/8	69 1/2	95 1/2
„ July	132 1/4	130	129 1/8	127 3/8	126 3/8	126 3/4	80 5/8	98 1/4	69 1/2	89 7/8
„ September	133 7/8	131 1/2	130 5/8	128 3/8	—	—	81	97 3/4	70 3/8	89 1/4
Buenos Aires (paper pesos p. 100 kg.):										
delivery February	...	...	...	...	...	...	6.76	7.96	7.00	12.13
„ March	...	...	...	...	...	...	6.80	8.09	7.05	12.15
„ April	...	...	...	...	...	...	6.83	* 7.90	—	12.21
Rye.										
Winnipeg (cents p. 56 lb.):										
delivery December	—	—	—	60	59 1/2	59 1/2	—	—	—	—
„ May	66 5/8	65 1/8	64 5/8	62 1/2	62 1/2	62 1/2	49 3/8	77 3/4	43 1/8	83 5/8
„ July	66 5/8	65 1/2	65	62 7/8	62 7/8	63	49 5/8	76 1/2	43 3/4	83
Chicago (cents p. 56 lb.):										
delivery December	—	—	—	—	66 5/8	* 67	—	—	—	—
„ May	84 3/4	79 7/8	76 5/8	73 5/8	72 7/8	73 3/8	46 5/8	70 7/8	47 1/4	75 1/8
„ July	87	82 1/4	79	75 7/8	74 7/8	75 1/2	47 3/4	70 1/4	48	70
„ September	88 3/4	84 1/4	79 1/8	77 5/8	—	—	* 48 1/2	70 1/8	48 3/4	* 67 1/8
Barley.										
Winnipeg (cents p. 48 lb.):										
delivery December	—	—	—	59 1/8	59 1/2	59 3/4	—	—	—	—
„ May	62	61 1/4	61 1/4	59 3/8	59 3/4	60 1/8	45 1/8	52 1/2	38 3/8	64 1/8
„ July	60 7/8	60 1/4	60 1/2	58 1/2	58 1/2	59 1/8	42 1/2	51 1/8	37 3/4	60 5/8
„ October	59 5/8	58 7/8	57 1/4	—	—	—	—	—	—	—
Minneapolis (cents p. 48 lb.):										
delivery May	...	...	...	...	...	...	42 5/8	43	34 3/8	* 52 1/4
Oats.										
Winnipeg (cents p. 34 lb.):										
delivery December	—	—	—	48 5/8	47 3/8	47 1/8	—	—	—	—
„ May	49 1/2	49 1/4	48 3/8	47 3/8	47	46 3/4	34 3/4	40 1/2	29 7/8	49 1/8
„ July	48 3/8	48 3/4	47 1/2	46 7/8	46 1/8	46	33	38 5/8	29 1/2	46 3/8
„ October	47	—	—	—	—	—	* 31 1/2	36 1/8	29 1/8	* 42 3/8
Chicago (cents p. 32 lb.):										
delivery December	—	—	—	—	53	* 52	—	—	—	—
„ May	59 1/2	58 3/8	57	56	56	55 3/4	36 3/4	39 5/8	29 1/4	32 1/8
„ July	58 1/2	57 5/8	55 3/4	54 1/2	54 1/8	54 1/4	32 7/8	34 5/8	28 1/8	29 3/4
„ September	58 1/8	57 1/4	55 1/2	—	—	—	32	32 3/4	27 3/4	29 5/8

* Indicates that the product was not quoted during part of the period under review.

Description	Jan. 16, 1942	Jan. 9, 1942	Jan. 2, 1942	Dec. 27, 1941	Dec. 19, 1941	Monthly averages: Dec. 1941	Jan. 1941	Jan. 1940	Jan. 1939	Jan. 1938
Maize.										
Chicago (cents p. 56 lb.):										
delivery December	—	—	—	—	77 7/8	* 77 3/4	—	—	—	—
" May	86	85 1/2	85 1/4	84 3/8	82 3/4	83 3/8	62 3/4	58 1/8	52 3/8	61
" July	87 5/8	87 3/4	87	85 7/8	84 1/8	84 7/8	62 3/4	58 1/4	53 3/8	61 1/2
" September	88 3/4	88 3/4	88 1/2	86 3/4	—	—	62 5/8	58 7/8	54	61 3/8
Linseed.										
Winnipeg (cents per 56 lb.):										
delivery December	—	—	—	157	155	155 5/8	—	—	—	—
" May	163	158 3/4	161 1/2	161	158	158 7/8	152 1/2	196 1/8	145 3/4	178 7/8
" July	161 1/2	158 1/2	161 1/2	161 1/4	158	159 1/4	151 5/8	193 3/4	—	178 7/8
Duluth (cents p. 56 lb.):										
delivery May	...	...	...	...	...	...	171 1/2	206 1/8	186 1/2	204 1/4
Buenos Aires (paper pesos p. 100 kg.):										
delivery February	...	...	...	...	...	...	9.35	5.32	13.48	16.07
" March	...	...	...	...	...	...	* 9.37	—	13.60	16.08
" April	...	...	...	...	...	...	9.47	—	—	16.13

* Indicates that the product was not quoted during part of the period under review.

PRODUCTION — LATEST INFORMATION

Argentina (Telegramm of January 29): According to the first official estimate, the area sown to maize in 1941-42 amounts to 12,603,000 acres against 15,068,000 in 1940-41 and an average of 15,957,000 acres in the five preceding years: percentages 83.6 and 79.0. The big decrease registered this year is to be attributed to the Government's program which aims at limiting the production of maize, owing to very heavy surplus stocks existing in the country and to exceptional export difficulties.

According to the first official estimate, the area sown to rice in 1941-42 has been considerably increased as compared with previous years: it amounts to 83,000 acres against 75,370 in 1940-41 and an average of 69,900 acres in the five preceding years: percentages 110.2 and 118.8.

APPENDIX

THE 1939 CENSUS OF AGRICULTURAL HOLDINGS IN GERMANY

Some information regarding the results of the census of agricultural holdings made in Germany on 17 May 1939 has already appeared in our Bulletin (1). We are now giving the data recently published by the Statistical Bureau of the Reich (2), relating to the distribution of agricultural and forestry holdings and their areas according to the mode of tenure. These data are still provisional; they deal with the territory of the Reich not including the Memel region and the Eastern territories annexed later.

The census, first of all, has ascertained the number and areas of holdings having land farmed by their owners and of holdings having land rented (see Table I), as well as the number and areas of holdings included in each of these two classes, where respectively the whole or over one half or less than one half of the whole area belongs to or is rented by the holder (see Table II). The percentages of holdings of each group compared with the total number, is shown in Tables III and IV. At the same time the census furnishes the data on areas farmed by owners and areas farmed by renters: separate data are given for

I. — *Number and area of holdings with owned land and of holdings with rented land.*

Classification according to total area	All holdings		Holdings with owned land		Holdings with rented land	
	Number	Area in acres	Number	Area in acres	Number	Area in acres
0.5 to 1 ha.	568,071	996,652	488,898	864,889	263,808	465,548
1 » 2 »	586,178	2,074,875	530,298	1,885,854	303,066	1,080,496
2 » 5 »	943,958	7,728,648	888,494	7,296,943	550,384	4,526,053
5 » 10 »	746,952	13,181,086	720,566	12,728,251	420,100	7,355,540
10 » 20 »	596,233	20,802,785	578,300	20,181,476	262,693	8,936,739
20 » 50 »	354,613	25,891,999	342,298	24,971,422	101,424	7,225,771
50 » 100 »	64,802	10,696.165	61,470	10,140,931	15,846	2,607,272
100 » 200 »	20,895	7,078,252	19,225	6,501,858	5,027	1,694,846
200 » 500 »	12,597	9,637,300	11,289	8,627,378	2,975	2,268,354
500 » 1000 »	4,480	7,618,593	4,164	7,117,322	961	1,615,910
1000 ha. and more	3,687	25,594,910	3,655	25,402,551	414	2,566,995
Total	*3,902,466*	*131,301,265*	*3,648,657*	*125,718,875*	*1,926,698*	*40,343,524*

(1) See Numbers of March 1940, page 262-S, September 1940, page 607-S, and March 1941, page 144-S.

(2) "Wirtschaft und Statistik" 1941, No 23, pages 425-430.

II. — *Number and area of holdings distributed according to the proportion of owned land and of rented land.*

Classification according to total area	Holdings: where the owned land corresponds to the total area	more than half of the total area	less than half of the total area	where the rented land corresponds to the total area	more than half of the total area	less than half of the total area
	Number of holdings					
0.5 to 1 ha.	294,650	95,301	98,947	73,359	90,647	99,802
1 » 2 »	271,510	158,668	100,120	49,141	94,380	159,545
2 » 5 »	374,260	378,492	135,742	44,137	128,430	377,817
5 » 10 »	317,476	332,163	70,927	21,816	68,701	329,583
10 » 20 »	328,861	216,856	32,583	16,101	31,771	214,821
20 » 50 »	251,190	81,952	9,156	11,647	8,879	80,898
50 » 100 »	48,562	11,426	1,482	3,227	1,465	11,154
100 » 200 »	15,701	2,990	534	1,609	520	2,898
200 » 500 »	9,503	1,516	270	1,281	255	1,439
500 » 1000 »	3,462	618	84	311	79	571
1000 ha. and more	3,196	433	26	30	19	365
Total	*1.918,371*	*1,280,415*	*449,871*	*222,659*	*425,146*	*1,278,893*
	Area of hotdings, in acres					
0.5 to 1 ha.	513,675	175,497	175,717	123,782	162,383	179,384
1 » 2 »	952,529	579,102	354,223	167,315	335,833	577,348
2 » 5 »	3,046,844	3,171,669	1,078,431	339,782	1,029,426	3,156,845
5 » 10 »	5,665,070	5,846,975	1,216,206	375,976	1,184,764	5,794,800
10 » 20 »	11,700,932	7,400,072	1,080,472	557,431	1,061,931	7,317,377
20 » 50 »	18,527,205	5,811,712	632,505	871,336	624,573	5,729,862
50 » 100 »	8,024,588	1,868,893	247,450	538,268	246,126	1,822,879
100 » 200 »	5,326,422	997,693	177,743	555,504	173,883	965,460
200 » 500 »	7,278,353	1,146,042	202,983	986,091	192,196	1,090,060
500 » 1000 »	5,902,757	1,066,105	148,461	497,885	134,855	983,171
1000 ha. and more	22,456,969	2,846,921	98,661	192,355	65,170	2,309,477
Total	*89,395,344*	*30,910,681*	*5,412,852*	*5,205,725*	*5,211,140*	*29,926,663*

III. — *Number of holdings with owned land, in % of all holdings.*

Classification according to total area	Holdings where the owned land corresponds to the total area	more than half of the total area	less than half of the total area	All holdings with owned land
0.5 to 1 ha.	51.9	16.8	17.4	86.1
1 » 2 »	46.3	27.1	17.1	90.5
2 » 5 »	39.6	40.1	14.4	94.1
5 » 10 »	42.5	44.5	9.5	96.5
10 » 20 »	55.2	36.4	5.4	97.0
20 » 50 »	70.8	23.1	2.6	96.5
50 » 100 »	74.9	17.6	2.4	94.9
100 » 200 »	75.1	14.3	2.6	92.0
200 » 500 »	75.4	12.0	2.2	89.6
500 » 1000 »	77.3	13.8	1.8	92.9
1000 ha. and more	86.7	11.7	0.7	99.1
Total	*49.2*	*32.8*	*11.5*	*93.5*

IV. — *Number of holdings with rented land, in % of all holdings.*

Classification according to total area	Holdings where the rented land corresponds to the total area	more than half of the total area	less than half of the total area	All holdings with rented land
0.5 to 1 ha.	12.9	16.0	17.5	46.4
1 » 2 »	8.4	16.1	27.2	51.7
2 » 5 »	4.7	13.6	40.0	58.3
5 » 10 »	2.9	9.2	44.1	56.2
10 » 20 »	2.7	5.3	36.1	44.1
20 » 50 »	3.3	2.5	22.8	28.6
50 » 100 »	5.0	2.3	17.2	24.5
100 » 200 »	7.7	2.5	13.9	24.1
200 » 500 »	10.2	2.0	11.4	23.6
500 » 1000 »	6.9	1.8	12.8	21.5
1000 ha. and more	0.8	0.5	9.9	11.2
Total	*5.7*	*10.9*	*32.8*	*49.4*

V. — *Area farmed by owners.*

Classification according to total area	Area farmed by owners in the holdings where owned land corresponds to the total area: acres	% of total area of all holdings	more than half of the total area: acres	% of total area of all holdings	less than half of the total area: acres	% of total area of all holdings	Total area farmed by owners: acres	% of total area of all holdings
0.5 to 1 ha.	513,675	51.5	127,481	12.8	44,769	4.5	685,925	68.8
1 » 2 »	952,529	45.9	427,973	20.6	95,947	4.6	1,476,449	71.1
2 » 5 »	3,046,844	39.4	2,453,338	31.7	315,467	4.1	5,815,649	75.2
5 » 10 »	5,665,070	43.0	4,721,875	35.8	371,946	2.8	10,758,891	81.6
10 » 20 »	11,700,932	56.2	6,188,976	29.8	333,768	1.6	18,223,676	87.6
20 » 50 »	18,527,205	71.6	5,032,387	19.4	186,498	0.7	23,746,090	91.7
50 » 100 »	8,024,588	75.0	1,645,183	15.4	63,398	0.6	9,733,169	91.0
100 » 200 »	5,326,422	75.2	890,084	12.6	39,206	0.5	6,255,712	88.4
200 » 500 »	7,278,353	75.5	1,055,543	11.0	28,998	0.3	8,362,894	86.8
500 » 1000 »	5,902,757	77.5	1,014,014	13.3	23,065	0.3	6,939,836	91.1
1000 ha. and more	22,456,969	87.7	2,784,970	10.9	44,776	0.2	25,286,715	98.8
Total	*89,395,344*	*68.1*	*26,341,824*	*20.1*	*1,547,838*	*1.1*	*117,285,006*	*89.3*

holdings where the land is wholly or over one half or less than one half farmed respectively by owners or by renters (see Tables V and VI). The area of land farmed directly by the owner, amounting to 117,285,006 acres, represents 89.3 per cent. of the total area of agricultural and forestry holdings. The area of land farmed by renters amounts to 13,514,307 acres and is only 10.3 per cent. of the total. The area of land farmed otherwise (*Heuerlingsland, Dienstland, Allmende, Nutzniessung*) amounts to 501,950 acres, i. e., 0.4 per cent. of the

VI. — *Area farmed by renters.*

Classification according to total area	Area farmed by renters in the holdings where rented land corresponds to						Total area farmed by renters	
	the total area		more than half of the total area		less than half of the total area			
	acres	% of total area of all holdings	acres	% of total area of all holdings	acres	% of total area of all holdings	acres	% of total area of all holdings
0.5 to 1 ha.	123,782	12.4	123,290	12.4	49,545	5.0	296,617	29.8
1 » 2 »	167,315	8.1	246,108	11.9	150,245	7.2	563,668	27.2
2 » 5 »	339,782	4.4	729,903	9.4	717,614	9.3	1,787,299	23.1
5 » 10 »	375,976	2.9	827,818	6.3	1,115,292	8.4	2,319,086	17.6
10 » 20 »	557,431	2.7	744,950	3.6	1,200,858	5.7	2,503,239	12.0
20 » 50 »	871,336	3.4	449,602	1.7	771,010	3.0	2,091,948	8.1
50 » 100 »	538,268	5.0	185,806	1.7	218,795	2.1	942,869	8.8
100 » 200 »	555,504	7.8	140,818	2.0	104,258	1.5	800,580	11.3
200 » 500 »	986,091	10.2	166,401	1.7	91,974	1.0	1,244,466	12.9
500 » 1000 »	497,885	6.5	114,738	1.5	50,339	0.7	662,962	8.7
1000 ha. and more	192,355	0.8	55,155	0.2	54,063	0.2	301,573	1.2
Total	*5,205,725*	*4.0*	*3,784,589*	*2.9*	*4,523,993*	*3.4*	*13,514,307*	*10.3*

total, and is subdivided according to the extent of the holdings to which it belongs, in the following manner:

Holdings	0.5 to 1 ha.	acres	14,110
»	1 » 2 »	»	34,758
»	2 » 5 »	»	125,699
»	5 » 10 »	»	103,109
»	10 » 20 »	»	75,867
»	20 » 50 »	»	53,961
»	50 » 100 »	»	20,127
»	100 » 200 »	»	21,961
»	200 » 500 »	»	29,940
»	500 » 1000 »	»	15,795
»	1000 ha and over	»	6,623
		acres	501,950

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country: Germany, Bohemia and Moravia (Protectorate); Hungary: 1 = *excellent,* 2 = *good,* 3 = *average,* 4 = *poor,* 5 = *very poor; Finland:* 8 = *very good,* 6 = *above the average,* 5 = *average; France:* 100 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *average,* 30 = *poor; Romania and Sweden:* 5 = *excellent,* 4 = *good,* 3 = *average,* 2 = *poor,* 1 = *very poor; Netherlands:* 90 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *below average; Portugal:* 100 = *excellent,* 80 = *good,* 60 = *average,* 40 = *poor,* 20 = *very poor; Switzerland:* 100 = *excellent,* 90 = *very good,* 75 = *good,* 60 = *fairly good,* 50 = *average,* 40 = *rather poor,* 30 = *poor,* 10 = *very poor; U. S. S. R.:* 5 = *good,* 4 = *above the average,* 3 = *average,* 2 = *below average,* 1 = *poor; Canada:* 100 = *crop condition promising a yield equivalent to the average yield of a long series of years; United States:* 100 = *crop condition which promises a normal yield; Egypt:* 100 = *crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed:* 100 = *crop condition which promises a yield equal to the average of the last ten years.*

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

See latest information at page 76

VEGETAL PRODUCTION

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE, BARLEY AND OATS.

Bulgaria: At a recent meeting, the Ministry of Agriculture prepared a new plan of sowings of summer crops to be done this spring. The plan contemplates a considerable increase of area to be sown to some cereals, including maize, sunflowers, kidney-beans, soya, and sugar beets, especially on fallow soils or in substitution of less advantageous crops. To this effect, the Ministry of Agriculture has addressed a circular letter to regional directors of agriculture who, in agreement with administrative directors, are instructed to call local meetings of provincial chiefs and agriculturists of all the zones of the region. In these local conferences, measures will be suggestad, examined and adopted for the immediate application, in the manners best suited for each region, of the decisions taken by the Ministry of Agriculture. Following the plan that will be adopted, all cultivable land, including turfs, private and public gardens, and all areas which, for any reason whatsoever had been left uncultivated last winter, will have to be seeded. Sanctions are contemplated against whomsoever fails to obey instructions. In order to make up for the scarcity of farm hands, the young people of the *Brannik* (Association of Bulgarian youth) will be called to do the work. If necessary, the decision of the Council of Ministers regarding civil mobilisation will be applied.

The largest increase of area is foreseen for summer wheat and barley. The area sown to oats will be considerably increased too. No increase is foreseen in the area to be sown to rye, which is chiefly a winter crop.

Greece: According to some unofficial information, in many cereal producing regions the condition of cereals appears good. It is reported also that, in spite of many difficulties, rather vast areas have been sown to cereals.

Area and Production of Cereals.

Countries	Area 1941	Area 1940	Area Aver. 1935 to 1939	Area % 1941: 1940 = 100	Area % 1941: Aver. = 100	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production % 1941: 1940 = 100	Production % 1941: Aver. = 100
	000 acres					000 centals			000 bushels				
Wheat													
Belgium	439	(w) 354	394	—	111.4	...	...	9,691	...	...	16,151	...	...
Denmark	203	199	316	101.8	64.1	4,189	4,094	8,617	6,981	6,823	14,361	102.3	48.6
Spain	9,445	8,735	(1)8,639	108.1	109.3	65,377	47,648	63,270	108,959	79,412	1)105,448	137.2	103.3
Finland	331	349	264	94.8	125.3	3,309	3,939	4,208	5,515	6,565	7,013	84.0	78.6
Ireland	491	305	225	160.9	218.4	...	7,011	4,613	...	11,685	7,689	...	...
Italy	...	12,566	12,639	...	...	157,631	156,754	167,713	262,713	261,251	279,517	100.6	94.0
Netherlands	339	331	338	102.2	100.2	...	...	9,113	...	...	15,188	...	...
Romania	(2)5,807	(2)5,014	9,054	115.8	—	(2)54,124	(2)30,225	84,491	(2)90,204	(2)50,375	140,816	179.1	—
Slovakia	550	533	(3) 539	103.1	102.1	6,955	6,740	(3) 8,572	11,591	11,233	(3) 14.287	103.2	81.1
Sweden	708	763	741	92.8	95.6	7,255	9,276	15,811	12,091	15,459	26,351	78.2	45.9
Switzerland	215	191	184	112.5	116.9	...	3,631	3,711	...	6,051	6,185	...	...
Canada	22,372	28,726	25,596	77.9	87.4	181,576	330,834	187,440	302,626	551,390	312,399	54.9	96.9
Un. St. (w)	40,316	36,147	41,186	111.5	97.9	567,540	353,491	351,467	945,900	589,151	585,778	115.8	124.1
Un. St. (s)	16,467	17,356	16.387	94.9	100.5		136,528	105,964		227,547	176,606		
Mexico	1,347	1,450	1,251	92.9	107.6	8,257	8,002	7,391	13.828	13,337	12,318	103.7	112.3
India (4)	34,499	34,003	34,485	—	—	224,400	241,562	222,396	374,000	402 603	370,660	92.9	100.9
Japan	1,983	2.024	1,738	96.1	114.1	32,377	39,682	30,078	53,960	66,135	50,130	81.6	107.6
Syria and Leb.	1,600	...	1,363	...	117.4	16,560	14,760	11,692	27,600	24,600	19,486	112.2	141.6
Algeria	...	...	4,176	...	...	19,200	16.560	20,890	32.000	27,600	34,816	115.9	91.9
Egypt	1,561	1,563	1,464	99.9	106.7	24.918	29,997	27,510	41,529	49,994	45,848	83.1	90.6
Tunisia	1,322	1,359	1,884	97.3	70.2	8,819	6,393	9,019	14.697	10,655	15,031	137.9	97.8
Argentina	5)18,039	5)17,569	5)18,664	102.7	96.7	136,687	162,706	131,710	227,807	271,171	219,512	84.0	103.8
Chile	1,660	1,930	1,963	86.0	84.6	...	...	18,937	...	...	31,562	...	...
Uruguay	1,043	924	1,228	112.8	84.9	...	4,235	7,954	...	7,058	13,256	...	...
Australia	12,654	12,454	13,128	101.6	96.4	99,658	49,583	101,821	166,096	82,639	169,702	201.0	97.9
New Zealand	300	240	221	125.0	135.5	6,000	5,040	4,277	10,000	8,400	7,129	119.0	140.3
Rye													
Belgium	310	280	369	110.7	84.1	...	...	7,790	...	...	13,910	...	...
Denmark	474	339	352	139.6	134.7	6,614	5,908	5 552	11,811	10,551	9,915	111.9	119.1
Spain	1.473	1,361	(1)1,302	108.2	113.1	8,754	7,740	(1) 9,041	15,632	13,821	(1)16,144	113.1	96.8
Finland	467	459	578	101.8	80.8	5,203	4,627	7,774	9,291	8,263	13,883	112.4	66.9
Netherlands	596	563	559	105.7	106,6	...	...	11,386	...	...	20,332	...	...
Slovakia	372	368	(3) 380	101.1	97.8	4.409	4,403	(3) 5,259	7,874	7,862	(3) 9,391	100.2	83.8
Sweden	509	422	495	120.5	102.7	6,113	5,862	8,304	10.916	10,468	14,828	104.3	73.6
Switzerland	35	25	38	136.2	90.6	...	498	711	...	890	1,269	...	...
Canada	1,077	1,035	816	104,1	131.9	7,374	7,837	5,147	13,167	13,994	9,191	94.1	143.3
United States	3,436	3,192	3,723	107.6	92.3	26,019	22,737	25,576	46,462	40,601	45,672	114.4	101.7
Argentina	(5)2,661	(5)2,751	(5)2,511	96.8	106,0	3,527	4,678	5,586	6,299	8,354	9,974	75.4	63.2
Chile	19	24	30	81.7	64.4	...	...	173	...	...	309	...	...
Barley													
Belgium	74	57	76	130.4	98.0	...	...	1,757	...	...	3,661	...	...
Denmark	930	956	939	97.2	99.0	20,503	25,104	25,191	42,715	52,301	52,483	81.7	81.4
Spain	3,886	3,859	(1)3.382	100.7	114.9	37,146	30,769	31,262	77,390	64,103	65,130	120,7	118.8
Finland	326	281	305	116.0	106.9	2,822	3,061	4,070	5,879	6,377	8,478	92.2	69.3
Ireland	169	132	118	128.0	143.2	...	3,114	2,598	...	6,487	5,413	...	...
Slovakia	489	497	(3) 492	98.5	99.5	5,842	6,719	(3) 6,946	12,172	13,999	(3) 14,470	86,9	84.1
Sweden	244	264	252	92,6	97,0	3,514	4,173	4,777	7,322	8,694	9,952	84.2	73.6
Switzerland	44	28	12	159.0	351.0	...	511	206	...	1,066	430	...	...
Canada	5,449	4,341	4,291	125.5	127.0	56,457	50,043	42,663	117,619	104,256	88,882	112.8	132 3
United States	13,977	13,394	10,774	104.4	129.7	168,731	148,433	113,409	351,522	309,235	236,270	113.7	148.8
Japan	...	1,848	1,892	...	...	36,385	37,198	35,112	75,803	77,498	73,152	97.8	103.6

Area and Production of Cereals.

Countries	Area					Production							
	1941	1941	Aver. 1935 to 1939	% 1941		1941	1940	Aver. 1935 to 1939	1941	1940	Aver. 1935 to 1939	= 1941	
	000 acres			1940 = 100	Aver. = 100	000 acres			000 bushels			1940 = 100	Aver. = 100
Algeria	...	...	3,058	...	...	15,360	7,920	15,415	32,000	16,500	32,114	193.9	99.6
Egypt	255	268	278	95.1	95.1	4,699	5,315	7,339	9,789	11,073	15,290	88.4	64.0
Tunisia	...	...	1,174	...	...	4,400	2,000	4,564	9,186	4,134	9,508	222.2	96,6
Argentina	(5)1,972	(5)2,139	(5)1,903	92.2	103.6	8,444	17,395	11,329	17,591	36,239	23,602	48.5	74.5
Chile	128	128	184	99.9	69.5	...	...	2,419	...	...	5,041	...	...
Uruguay	67	54	(6) 36	122.7	—	...	216	(6) 259	...	450	(6) 539	...	...
New Zealand	30	26	24	115.4	125.5	550	481	461	1,146	1,002	961	114.4	119.2
OATS													
Belgium	413	...	548	...	75.4	...	...	14,074	...	...	43,982	...	...
Denmark	846	843	926	100.3	91.4	16,314	19,641	22,303	50,982	61,378	69,697	83.1	73.1
Spain	1,646	1,597	(1)1,423	103.1	115.7	12,469	10,459	(1)10,549	38,964	32,685	(1)32,966	119.2	118.2
Finland	1,055	1,054	1,142	100.1	92.4	10,715	11,128	15,974	33,483	34,776	49,917	96.3	67.1
Ireland	779	681	571	114.4	136.5	...	16,222	12,565	...	50,694	39,265	...	...
Slovakia	370	365	(3) 333	101.5	131.3	...	4,596	(3) 3,660	...	14,363	(3) 11,437	...	...
Sweden	1,553	1,569	1,641	99.0	94.7	17,139	20,660	27,904	53,459	64,563	87,199	83.0	61.4
Switzerland	80	53	28	150.2	286.3	...	1,140	510	...	3,562	1,593	...	...
Canada	13,841	12,298	13,246	112.6	104.5	120,138	129,379	114,94	375,430	404,309	359,201	92.9	104.5
United States	37,236	34,847	35,417	106.9	105.1	364,430	395,401	329,369	1,138,843	1,235,628	1,029,279	92.2	110.6
Algeria	...	...	470	...	...	2,560	...	3,387	8,000	...	10,585	...	75.6
Argentina	(5)3,519	(5)3,899	(5)3,567	90.2	98.1	10,362	11,894	16,254	32,380	37,168	50,795	87.1	63.7
Chile	168	198	279	85.3	60.3	...	...	2,455	...	...	7,670	...	...
Uruguay	237	225	213	105,5	111.2	...	421	992	...	1,316	3,100	...	...
New Zealand	60	61	63	98.4	95.4	1.080	1,120	1,174	3,375	3,500	3,669	96.4	92.0

(*w*) Winter crop. — (*s*) Spring crop. — (1) Year 1939. — (2) Not including territories transferred in 1940. — (3) Average of two years — (4) Final estimate except for 1941 area, the figure of which is that of the fourth estimate. — (5) Area sown. — (6) Not including barley for brewery.

Hungary: During the four weeks, beginning December 13, 1941 up to the 9th of January of this year, the weather was favourable to agricultural work. Thanks to the mildness of temperature, especially at the beginning of the period under consideration, it was possible to attend also to some autumn works that had been slowed down and deferred by bad weather in the month of November. In many places, autumn sowings could be completed; at the beginning of December, deep plowing could also be completed everywhere. Towards the 10th January, the condition of winter cereals that had been sown early, was good; but late sowings were developping slowly, and in some places they had not sprouted yet. During most of the four weeks January 10-February 6, the temperature was exceptionally low. Rains were much more abundant than average over nearly 2/3 of the country. Intense cold and a heavy coat of snow made working in the fields altogether impossible.

During this period, winter sowings were covered by a heavy coat of snow all over the country. Under the protection of the snow, late sowings grew well, and sowings that had not sprouted until then, began to develop. In many places, violent winds raised the snow and formed heavy snow heaps. It may be expected that in these places, frost and the weight of the snow have done some damage.

Romania: At the beginning of February the whole country was covered with snow. Cereals seedings were well protected, and up to that date, no important damages had been reported as having been caused by frost. Competent authorities are very actively preparing in its minutest details the program of spring sowings, which, this year, have a particularly great importance not only on account of the state of war, but especially because they are expected to make up for the deficiencies of winter cereals caused by bad weather in autumn. The Romanian government has put at the disposal of the Ministry of Agriculture a considerable sum for the financing of seeds purchases and distribution to agriculturists. In order to make sure that the program of sowings will be strictly enforced, a very severe system of control has been established in each Commune. Each holding of over 25 hectares (60 acres) must prepare a plan of sowings. A careful and timely inquiry on the means of agricultural production will be carried on in each Commune, which will make it possible for competent authorities to follow the course of the spring seeding season considered as a veritable agricultural mobilisation.

For the next season, the Romanian Government has made new purchases of tractors in Germany. The instruction to the necessary mechanicians is given at the Chambers and Schools of Agriculture. A growing demand for tractors is reported from every part of the country, especially Bessarabia. In order to intensify the culture of spring barley and to improve agricultural technique, the Ministry of Agriculture has created a barley competition in 14 departments which are important barley producers.

Serbia: In order to insure the bread supply for the population, the Serbian Central Direction of Cereals, following a law enacted by the Council of Ministers, has decreed the admixture of wheat with maize for bread making. By the same decree, wheat and maize become articles of monopoly, and the Serbian Central Direction of cereals is charged with the purchase, distribution and price fixation of these two cereals.

Argentina: Towards the end of January, cereal threshing was about over. Wheat yields were good, while oats, rye and barley production seemed rather poor.

CURRENT INFORMATION ON MAIZE.

Bulgaria: According to a statement by the Ministry of Agriculture, the 1941 maize crop was more than satisfactory, so that all the needs of the country for this product are fully provided for. It is believed that in 1942 the area sown to maize will be considerably increased. (See details under " Cereals ").

Argentina: January rainfalls helped the growth of maize. Towards the end of that month, the condition of the maize crop was held good. The area sown to maize in 1941/42, estimated at 12,603,000 acres, shows a decrease of 16.4 per cent. as compared with 1940/41 and 21 per cent. as compared with the average. This decrease was due to the existence in the country of large surplus stocks, and to the serious difficulties which at the present time, make exports well nigh impossible.

CURRENT INFORMATION ON RICE.

Bulgaria: According to recent, though unofficial, information, the production of rice in 1941 amounted to 790,000 centals (1,764,000 bushels) against an average of 469,000 centals (1,041,500 bushels) during the five years 1935/39. The production of 1940 is not yet known.

Romania: The program for the next agricultural season includes also an intensification of the culture of rice. The Ministry of Agriculture is encouraging in every possible way all farmers that wish to increase rice culture, especially by offering them the technical assistance of the competent organs of the Ministry. It is foreseen that the area sown to this crop will be increased.

Chosen: The production of rice in 1941-42 is estimated at 101,880,000 centals (226,400,000 bushels) against 87,970,000 (195,500,000) in 1940-41 and an average of 84,250,000 (187,220,000) in 1935-36 to 1939-40; percentages, 115.8 and 120.9.

CURRENT INFORMATION ON POTATOES.

Bulgaria: According to very recent, though unofficial, information, the area sown to potatoes in 1941 amounted to 60,000 acres against an average of 45,000 acres sown to that crop in the five year period 1935/39. It is not known yet which was the area to potatoes in 1940. Data on production in 1941 have not been published either, but according to statements by the Ministry of Agriculture, production in 1941 was abundant and greater than that of the year 1940 (2,794,000 centals = 4,656,000 bushels).

Romania: The program of work for the next agricultural season includes also the intensification of the culture of potatoes, especially in the sub-Carpathian zones, where this crop will replace maize, which very often does not reach the ripening stage. Selected potatoes have been bought in Germany for this purpose.

CURRENT INFORMATION ON SUGAR.

Bulgaria: The plan for summer cultures in 1942 recently prepared by the Bulgarian Government, foresees a considerable increase of areas sown to sugar beets.

Production of Beet-Sugar (raw).

COUNTRIES	TOTAL PRODUCTION DURING THE SEASON						% 1941-42	
	1941-42 (1)	1940-41	Average 1935-36 to 1939-40	1941-42 (1)	1940-41	Average 1935-36 to 1939-40	1940-41 = 100	Average = 100
	thousand centals			short tons				
Belgium	5,467	5,633	5·154	273,000	281,600	257,721	97	106
Bulgaria	(2) 1,235	(2) 1,052	476	(2) 62,000	(2) 52,579	23,798	117	259
Croatia	(2) 419	(2) 383	—	(2) 21,000	(2) 19,161	—	109	—
Denmark	6,283	5,490	4,949	314.000	274,000	247,463	114	127
Spain	4,079	3,530	3,251	204,000	176,497	162,545	115	125
Finland	(3) 91	165	257	(3) 4,557	8,233	12,836	55	36
France	(3) 15,310	(3) 10,377	20,513	(3) 765,486	(3) 518,857	1,025,635	148	75
Italy	10,053	13,387	8,350	503,000	669,330	417,471	75	120
Latvia	(3) 529	(3) 1,118	979	(3) 26,000	(3) 55,913	48,970	47	54
Lithuania	(3) 522	(3) 729	541	(3) 26,099	(3) 36,457	27,069	72	96
Romania	(3) 1,837	1,881	2,798	(3) 91,858	94,031	139,891	—	—
Serbia	(3) 799	(4) 2,425	(4) 1,913	(3) 39,928	(4) 120,000	(4) 95,665	—	—
Slovakia	1,459	(5) 1,407	(3) 1.190	72,930	(5) 70,333	(5) 60,000	104	123
Sweden	6,878	6,855	6,805	344,000	342,770	340,241	100	101
Switzerland	(3) 422	408	251	(3) 21,079	20,400	12,536	103	168
United States	(3) 30,600	37,758	30,409	(3) 1,530,000	1,887,903	1,520,407	81	101
Japan	882	643	949	40,000	34,657	47,451	127	93
Turkey	1,984	1,955	1,509	100,000	97,740	75,468	102	131

(1) Approximate data. — (2) Licht's estimate — (3) Data of International Association for Sugar Statistics. — (4) Former Yugoslavia. — (5) Season 1939-40.

According to the most recent estimate the area cultivated to sugar beet this year will be about 69,000 acres against 47,000 in 1941 and 26,000 on the average of the five years ending in 1940; percentages 147.0 and 278.0.

Spain: The mixed Commission for the control of sugar production of the Ministry of Agriculture has fixed the total production of sugar beets at 50,700,000 centals (2,500,000 short tons). The Commission has also fixed the amount of sugar beets to be produced in each zone. The sworn committees of the sugar beet industry are authorised to fix the normal production of sugar beets in each department of their zone and to proceed to the subdivision of the quantities to be produced by each beet sugar grower.

India: According to some information from Calcutta, the production of sugar from sugar cane in 1941/42 would amount to only 2/3 of the 1940/41 production.

WINE PRODUCTION IN 1941

by Dr. M. Costa

Information on the course of the wine season reaching the Institute from various sources makes it possible to estimate its results with remarkable approximation, in spite of some inevitable gaps. The general condition of vines at the beginning of Spring 1941 was mostly good, except in some zones, where, owing to excessive cold and humidity, vegetation had been retarded. Later, sunshine and heat had caused a marked improvement in the situation: weather conditions in June and July had been quite favourable to the vegetative development of vines and had prevented the spreading of cryptogamic maladies, against which it would have been impossible to carry on a successful fight owing to the difficulty of getting as adequate and abundant protective remedies as in former years. At the end of July the situation in most of the wine producing countries promised a good yield in raisins. But bad weather all through August and September, caused the spread of mildew and oidium which did considerable damage in many countries. Besides, as vines in the Spring had flowered late, it was impossible to make up for this delay, and in some zones vintage was done later than in normal years.

The information gathered by the Institute regarding nearly all the wine producing countries may be summed up as follows:

In France, flowering took place in good conditions, and early forecasts seemed to promise a very abundant vintage. But bad weather in August and September seriously damaged the plants. Wine production, which at the beginning of summer had been estimated at almost 1,320 millions Imperial gallons (1,585.0 millions American gallons) resulted, after vintage, of only 935.0 millions Imperial gallons (1,123.0 millions American gallons). This means that the 1941 production is 5 per cent lower than the already weak one of the year before (985,5 millions Imperial gallons = 1,183.5 millions American gallons).

Taking into account the quantities destined to the production of special wines, the making of alcohol, consumption by producers, and exports, available

wine could not fill the demand of average private consumption during the year 1941-42. For this reason, some months ago, wine rationing was decreed by competent authorities. Last December the ration was 0.2 Imperial gallons (0.3 American gallons) per week and registered consumer, and 0.4 Imperial gallons (0,5 American gallons) and 0,7 Imperial gallons (0,8 American gallons) respectively for first and second class labourers (labourers doing heavy work).

Information regarding the 1941 wine season in Italy is scarce. According to a statement published in August by the Confederation of wine producers, wine production at that time was estimated at 814,0 millions Imperial gallons (977,5 millions American gallons). But, owing to the September drought in several regions of Northern Italy and in the Islands, the correctness of this forecast is subject to some doubt. Probably vintages yielded about 780,0 millions Imperial gallons (938,0 millions American gallons). On the basis of this figure, it may be said that the Italian wine production in 1941 was below average (average 1934-38, 836,0 millions Imperial gallons (1,004.0 millions American gallons), but above that of 1940 when an absolute minimum had been registered with 666,5 millions Imperial gallons (800,5 millions American gallons). In 1939, on the contrary, production had been particularly abundant (937,0 millions Imperial gallons = 1,125.5 millions American gallons). The quality of the 1941 wine crop is estimated good.

During the month of April, flowering in Spain was normal and conditions were favourable to vines also in the month of May. Anti-cryptogamic treatments however were necessarily weak. Unfavourable weather did some damage to and retarded the vegetation of vines in some important wine producing regions. At the end of July, the condition of the plants was held generally good, except in some regions, including Arragon. Heavy and widespread attacks of mildew made conditions very much worse in the month of August: in Ciudad Real and Alicante damages were considerable.

On the whole, about the middle of September forecasts were poor for the regions of Arragon and Andalusia (except the provinces of Cadix, Huelva and Malaga); bad in many provinces of the region Castellano -Lionesa (particularly at Valladolid); average in the Galaico-Asturian region and Estremadura; rather good in the Canary Islands and in the Cantabric and Catalonia regions. In October the weather was fine and vintages were done in good conditions. Alcohol percentage seems rather low. Wine production in Spain has been estimated at 319.0

Production of wine in the three most important European countries.

Million Imperial Gallons and (Million American Gallons).

	France		Italy		Spain	
Average 1924-28	1,278.1	(1,534.8)	921.7	(1,106.9)	490.5	(589.1)
» 1929-33	1,194.5	(1,434.4)	844.7	(1,014.4)	442.2	(531.0)
» 1934-38	1,377.0	(1,653.7)	836.0	(1,004.0)	385.0 [1]	(462.5)
Year 1939	1,496.0	(1,796.0)	937.0	(1,125.5)	248.5	(298.5)
» 1940	985.5	(1,183.5)	666.5	(800.5)	310.0	(372.5)
» 1941	935.0	(1,123.0)	780.0 [2]	(938.0)	319.0	(383.0)

(1) Average 1934 to 1936. — (2) Unofficial estimate.

millions Imperial gallons (383.0 millions American gallons), against 310.0 millions Imperial gallons (372.5 millions American gallons), in 1940, 248.5 millions Imperial gallons (298.5 millions American gallons) in 1939 and an average 385.0 millions Imperial gallons (462.5 millions American gallons) in the three years 1934/36.

As regards the other European wine producing countries of lesser importance, it is known that wine production in Romania has been very low. Flowering was normal, but the lack of copper sulphate made it impossible to fight with the necessary energy cryptogamic maladies which prevailed during the summer. Vintage began about the middle of October; but, owing to insufficient heat, grapes ripened irregularly. The quality of the wine is mediocre, and quantity is estimated considerably below 220.0 millions Imperial gallons (264.0 millions American gallons).

Statistical estimates about wine production in Portugal are lacking. The most recent information reaching the Institute goes back to last August. During the summer months, vines were attacked by pests and maladies that did heavy damages. The regions of Braga, Porto and Elvas were most severely hit. Production seems to have been about average: probably between 143.0/154.0 millions Imperial gallons (172.0/185.0 millions American gallons). This figure indicates a higher production than that of 1940, which had been very low (only 114.5 millions Imperial gallons (137.5 millions American gallons).

Yields of vintages in Greece seem to have been quite satisfactory.

Regarding Hungary, it is known that the wine season started late, owing to prolongued cold; but vegetation proceeded later under good conditions. At the beginning of July, vines were doing well. During the summer, conditions were regular, except for some attacks of mildew which hit most particularly the vines situated in the lowest zones. In October the weather was unfavourable to the ripening of grapes, vintage was delayed and, here and there, it was done under unsatisfactory conditions. Production was below average (44.0/55.0 millions Imperial gallons = 53.0/66.0 millions American gallons). This figure is neatly higher than that of the 1940 vintage which did not even reach 22.0 millions Imperial gallons (26.5 millions American gallons).

In Germany results varied from region to region. Production appears to have been a good average.

In Bulgaria, mildew did some damage to vines and could not be properly combated owing to scarcity of copper sulphate; weather was not altogether favourable, especially on account of summer rains. Notwistanding adverse conditions, the 1941 wine production is estimated at 44.0 millions Imperial gallons (53.0 millions American gallons); that means that it was neatly higher than the low one of 1940 and also somewhat above average.

Thanks to the good conditions under which flowering took place and to summer heat, vines developped beautifully in Switzerland. Thus, except for some small damage caused by hail, the wine season was good. Wine production is estimated at 20,0 millions Imperial gallons (24,0 millions American gallons), of which 15,5 millions Imperial gallons (18,5 millions American gallons) were white wine. This abundant production is higher than that of 1940 and of the average.

In Slovakia, production was quite satisfactory, much greater than the low one of 1940, and it is estimated at nearly 4,5 millions Imperial gallons (5,5 millions American gallons).

The total production of raisins in the United States in the year 1941 was estimated at about 53,0 million centals, which is about average. The production of wine is estimated at 132,0 millions Imperial gallons (158,5 millions American gallons).

As regards Turkey, it is known that during the summer months vines were doing generally well. Floods and the excessive humidity of the 1940-41 winter did not cause heavy damages. The 1941 production, however, is estimated below average.

The first information received from North Africa indicated that the yield of vintage in Algeria would be very abundant. But in July and August vines suffered heavy damages from drought, hot winds and pests. It seems that the Algerian production of wine was of only 231,0 millions Imperial gallons (277,5 millions American gallons, i. e., almost 25 per cent below that of 1940 (308,0 millions Imperial gallons = 370,0 millions American gallons), and 40 per cent below the average of the years 1935-39 (376,0 millions Imperial gallons = 451,5 millions American gallons). Owing to poor production in France and the necessity of producing alcohol, wine exports from Algeria to European countries besides France, will amount to nearly nothing this year.

According to unofficial information, wine production in French Morocco was, on the whole, average; and it is estimated at 11,0 millions Imperial gallons (13,0 millions American gallons).

Information regarding the course of the season in the wine producing countries of the Southern hemisphere (Argentina, Chile, Brazil, Uruguay, the Union of South Africa and Australia) where raisins are now nearly ripe or about to be vintaged, are lacking. On the other hand, all these countries are of a very limited importance as wine producers: taken all together, they yield only about 5-10 per cent of the world total.

World production of Wine.

Million Imperial Gallons and (Million American Gallons).

Average 1924 to 1928	3,938.0 (4,729.0)	of which in Europe [1])	3,326.0 (3,994.0)
» 1929 » 1933	4,004.0 (4,808.0)	» »	3,240.0 (3,891.0)
» 1934 » 1938	4,395.0 (5,278.0)	» »	3,476.0 (4,174.0)
Year 1939	4,124.0 (4,953.0)	» »	3,322.0 (3,989.0)
» 1940	3,300.0 (3,963.0)	» »	2,640.0 (3,170.0)
» 1941	3,520.0 (4,227.0)	» »	2,750.0 (3,302.0)

(1) Including U. S. S. R.

Summing up, according to this information that the Institute has gathered from different sources, some of which quite unofficial, the results of the world wine season register a production of 3,520.0 millions Imperial gallons (4,227.0 millions American gallons) in a round figure. This production is 6,7 per cent

higher than the very poor one of 1940, but 14,7 per cent and 19,9 per cent below the production of the year 1939 and the average of the five years 1934-38 respectively.

Alcohol percentage is generally inferior to that of 1940. As surplus stocks from the previous season are small, the new wine production will be easily disposed of during the commercial year 1941-42.

CURRENT INFORMATION ON VINES.

Bulgaria: According to recent, though unofficial, information, the area planted to vines in 1941 (grapes for wine and raisins for the table) amounted to 320,000 acres, against 296,000 in 1940.

CURRENT INFORMATION ON OLIVES.

Portugal: According to press information, the olive oil production has been very abundant in all provinces. It seems that production was so high that, owing to an increase of work, several refineries could not be closed within the period of time set by the law.

WORLD LINSEED PRODUCTION IN 1941-42

In the December 1941 number of this Bulletin we published a general survey on world linseed production in 1941/42. The second estimate on production in Argentina and Canada, now available, modifies but slightly preceding forecasts. The Argentine linseed production in 1941/42 is estimated at 36,817,000 centals, (65,745,000 bushels) showing a decrease of 661,000 centals (1,181,000 bushels) as compared with the December estimate. Notwistanding this, however, it is 14.4 per cent. higher than the production of 1940/41 and about 12 per cent. above the average of the five preceding years. These good results were obtained on an area which was almost 8 per cent. smaller than average, and were made possible by weather conditions which were very favourable to the crop in the most important linseed producing centers of the country. The present production, thus revised, implies a carry over, in the year 1942, of a net exportable surplus of over 31,967,000 centals (57,084,000 bushels). To this amount must be added the heavy burden of unsold stocks from the 1940/41 crop, which, at the end of 1941, amounted to 14,330,000 centals (25,590,000 bushels). Thus the total Argentine surplus stocks available for exports this year, reach the figure of 46,297,000 centals (82,674,000 bushels), i. e., an enormous amount which is over 1/3 greater than that of average exports during the five years 1935/39 (33,069,000 centals = 59,053,000 bushels).

The second Canadian estimate which normally is not very far from final results, amounted to 3,624,000 centals (6,472,000 bushels), thus showing a decrease of 498,000 centals (890,000 bushels) from the preceding estimate, against 1,706,000 centals (3,047,000 bushels) obtained in 1940 and an average of 858,000 centals (1,531,000 bushels) during the five preceding years: percentages 212.3 and 422.3

per cent. This excellent Canadian crop was due chiefly to an exceptional increase of area sown to linseed, which was more than trebled as compared with the average.

Taking into account the revised figures relative to previous estimates made in these two countries, the world linseed production in 1941/42 (not including the U. S. S. R.) is now figured at almost 74,670,000 centals (133,341,000 bushels). This production is nearly 9 per cent. bigger than the good one of the year 1940/1941 and 29.7 and 16.6 per cent. above the averages of the quinquenniums ending respectively in 1939/40 and 1934/35.

World Production of Linseed by Continents.

(1,000 bushels of 56 lb.).

Continents	1941-42	1940-41	Average 1935-36/1939-40	Average 1930-31/1934-35
North and Central America	38,384	34,369	12,724	13,976
South America	68,501	59,643	62,588	77,910
Argentina	(65,745)	(57,462)	(58,672)	(74,347)
Asia (1)	18,070	19,369	17,653	15,984
Europe (2)	3) 7,900	8,661	9,385	5,905
U. S. S. R.	...	...	4) 29,526	29,837
Africa	472	472	442	559
Oceania	39	39	26	59
General totals:				
Excluding U. S. S. R.	133,340	122,553	102,818	114,393
Including U. S. S. R.	...	...	132,344	144,230

(1) Excluding U. S. S. R. and China. — (2) Excluding U. S. S. R. — (3) Estimate largely approximate. — (4) Unofficial data.

This is an exceptionally good production, due chiefly to the excellent results registered in North America, whose total yield grew progressively from an average of 7,125,000 centals (12,724,000 bushels) in 1935/39, to 19,246,000 centals (34,369,000 bushels) in 1940 and 21,495,000 centals (38,384,000 bushels) in 1941. Among the factors that this year have caused in North America a higher production than the already good one of the year before, must be mentioned, as regards Canada, the exceptional increase of area, and as regards the United States, the exceptionally fine weather which was very favourable to the linseed crop.

As regards Europe (considering this continent within the old frontiers of 1938), the same numerous statistical gaps mentioned in our December 1941 Bulletin, are to be registered this year. The production of this continent, conjecturally estimated at 4,409,000 centals (7,874,000 bushels), would be over 15 per cent. below average. Damages caused by war, raging over the typically linseed producing regions of the continent at the time of harvest, must be considered responsible for this poor result.

No variation has been brought to previous estimates regarding the 1941 production in Asia and Africa, which was a good average one in both continents.

A. D. F.

CURRENT INFORMATION ON FLAX.

Bulgaria: According to the most recent estimate area cultivated to Flax in 1941 was 20,300 acres, against 12,400 in 1940 and 8,000 on the average of the preceding 5 year period; percentages: 164.0 and 252.5. The corresponding production is estimated at about 21,000 centals against 11,000 and 7,500; percentages: 190.0 and 278.7.

Croatia: According to unofficial information, the 1941 linseed production was abundant, and may have reached 22,000 centals (39,400 bushels), i. e., nearly 70 per cent. of the yearly average production in former Jugoslavia.

Area sown to flax this year has been considerably increased. During the last years, the area sown to this crop was around 35,000 acres. It is estimated that, in the next few years, the production of flax fiber may be doubled.

Spain: According to informations published in the press, the area cultivated to flax in 1940 was 8,800 acres against 5,400 in 1939. The corresponding production of fibre is estimated at about 43,000 centals against 21,900 and that of linseed 24,500 centals (47,700 busheis) against 10,400 (18,500).

Romania: The propaganda of the Ministry of Agriculture for an intensification of textile crops in 1941 was a great succes as regards flax. In fact the area sown to flax in 1941 was 103,800 acres as against 30,200 in 1940. These figures are referring to the Romanian territory after all territorial cessions. This result is very important, if one considers that the average area sown to flax in the years 1935/39 on the Romanian territory before territorial cessions was of only 53,800 acres. Owing to low yield, flax production in 1941 amounted to only 242,500 centals; this figure however, is higher than that of the 1935/39 average referring to the Romanian territory before the territorial cessions (185,600 centals).

CURRENT INFORMATION ON COTTON.

Bulgaria: According to the most recent estimate the area cultivated to cotton in 1941 was about 173,000 acres against 124,000 in 1940 and 118,000 on the average of the five years ending 1939; percentages 140.0 and 146.4.

CURRENT INFORMATION ON HEMP.

Bulgaria: According to most the recent unofficial estimate area cultivated to hemp (fibre) in 1941 was 34,100 acres, against 27,200 in 1940 and 20,000 on the average in the preceding 5-year period; percentages: 125.5 and 170.2. The corresponding production is estimated at about 16,755,000 pounds against 16,731,000 pounds and 8,561,000 pounds; percentages: 100.1 and 195.7.

Romania: In recent years, the Ministry of Agriculture has made important efforts to encourage the cultivation of hemp for tow. In 1941 a noticeable increase of area sown to hemp was obtained (111,000 acres against 80,300 in 1940). This means an increase of 38.5 per cent. These data are referring to Romanian territory after all the territorial cessions in 1940. On the territory before the cessions the average area sown to hemp in the year 1935/39 was 126,700 acres. Yields were comparatively low, so that the production of tow in 1941 shows a smaller increase (16.7 per cent.) than in 1940. The final figures are: 463,000 centals of tow in 1941 against 397,000 in 1940. Average production in the years 1935/39 over the Romanian territory before territorial cessions, was 653,400 centals.

CURRENT INFORMATION ON TOBACCO.

Bulgaria: According to the plan prepared by the Bulgarian Government for spring sowings, it is expected that the area sown to tobacco in Bulgaria in 1942 (within the old frontiers) will equal that of the year 1941 (111,000 acres). But due account must be taken also of the areas that will be cultivated to tobacco in the zones recently acquired by Bulgaria. In these zones, the area to tobacco in 1942 should be 98,800 acres; so that the total area to tobacco in 1942 all over Bulgaria would amount to 210,000 acres.

Croatia: The Croatian Direction of Tobacco Monopolies has authorized this year the plantation of 314 million plants of tobacco, i. e., 15 per cent. more than last year.

Serbia: The Direction of Tobacco Monopolies has recently prepared a plan for tobacco plantations in 1942. According to this plan, 500 million plants of tobacco will be cultivated all over the country, of which 35 millions in the Serbian Banat and the rest in Serbia. The same plan has also fixed the quantities and qualities of tobacco to be cultivated in the different districts. The distribution of seeds and the control of the plantations will be confided to ten Stations in Serbia and two in the Serbian Banat. Prices of tobaccos according to quality and origin have also been fixed by the plan.

CURRENT INFORMATION ON OTHER PRODUCTS.

Groundnuts.

Senegal: Owing to the long drought, the harvest of groundnuts in 1941 has yielded only 5,600,000 centals, against 9,990,000 in 1940 and about 13,000,000 as an average Percentages: 56.0 and 42.0 per cent.

Soya.

Bulgaria: The Bulgarian government has recently prepared a plan for summe sowings providing for a considerable increase of area sown to soyabean.

According to the most recent estimate the area cultivated to soyabean this year will be about 173,000 acres against 98,800 in 1941 and 38,200 on the average of the five years ending 1940; percentages 175.0 and 452.5.

Croatia: According to unofficial information, the 1941 soya production was very good, and may have reached 44,000 centals (73,000 bushels), i. e., nearly 3/4 of the total production in former Jugoslavia in the years 1938 and 1939.

Serbia: An "Association of Serbian producers of oleagineous seeds" has been recently created at Belgrade. For the time being, this Association will deal with the cultures of soyabeans and sunflowers. For an intensive cultivation of soyabeans, the Association has chosen the very fertile region of Macva in northwestern Serbia, which is very good for it both as regards the quality of the soil and the climate. In this region only, 14,200 acres will be sown to soyabeans of the best quality. This is almost double the area that was cultivated to soya in former Jugoslavia.

Sunflower.

Bulgaria: According to the most recent estimate the area cultivated to sunflower in 1941 was about 494,200 acres against 364,500 in 1940 and 389,500 on the average of the five years ending 1939; percentages 136.0 and 126.6. The Ministry of Agriculture has taken all necessary measures for an increase of area sown to sunflowers in 1942. The purpose of these measures is to obtain a production which, not only may be sufficient to fill the needs of the country, but also leave some surplus for export.

Croatia: According to unofficial information, the 1941 production of sunflowers was rather abundant, and may have reached 220,000 centals (787,000 bushels). This production is 1/3 higher than the total of the years 1938 and 1939 in former Jugoslavia.

CURRENT INFORMATION ON FODDER CROPS.

Hungary: At the beginning of February, it was estimated that the stocks of fibrous forages for winter feeding would suffice if carefully distributed. Available amounts of forage cereals were rather weak.

Argentina: January rainfalls were very favourable to forage cultures. The condition of forage plants is considered good.

LIVESTOCK AND DERIVATIVES

MILCH COWS AND MILK PRODUCTION IN BELGIUM.

The Central Statistical Bureau of the Belgian Ministry of Economic Affairs has just published a statistical note on the milk problem in Belgium.

The total number of milch cows registered on the occasion of the agricultural and horticultural census of May 15, 1941 amounted to 825,418 subdivided by provinces as shown in the following table, in which is also indicated the percentage of the number of milch cows as compared with the total of cattle heads.

Provinces	Total number of		%
	cattle	milch cows	
Antwerp	186,207	84,431	45.34
Brabant	232,165	101,104	43.54
West Flanders	291,319	101,566	34.86
East Flanders	270,409	122,614	45.34
Hainaut	289,544	113,966	39.36
Liege	220,563	101,398	45.97
Limbourg	142,266	64,526	45.35
Luxemburg	174,086	68,112	39.12
Namur	178,091	67,701	38.01
Whole Kingdom	*1,984,650*	*825,418*	*41.59*

Thus the percentage of milch cows as compared with the total number of cattle heads is about 42 per cent.

As regards Belgium, it may be said that this percentage is quite normal. In Denmark where the raising of livestock is much more intensive, the proportion runs up to 50 per cent.

It has often been attempted to establish the relation existing between the number of cows and the total area of cultivated land. This relation is arbitrary and cannot give any serious indication on the rational exploitation of the Belgian agricultural soil. In order to establish a more correct co-relation one should calculate the relation existing between the number of milch cows and the total area of forage cultures. By this means one could get a very important index on the importance of milch chaptel in relation to the bulk of fodder production.

The following are considered as fodder producing cultures: beets and forage carrots, rape-seed, Swedish turnips, turnip-cabbage, forage cabbage, various kinds of clover, lucerne, maize, sainfoin and other forage cultures, mown meadows and pastures, orchards.

The next table contains the subdivision by province of cattle heads and the number of milch cows in relations to forage cultures according to the above definition:

PROVINCES	Total area of forage cultures (Hectares)	Total number of cattle and milch heads			
		Oxen		Cows	
		Absolute figures	Number by 100 ha. of forage culture	Absolute figures	Number by 100 ha. of forage culture
Antwerp	69,889	186,207	266	84,431	120
Brabant	98,287	232,165	236	101,104	103
West Flanders	109,868	291,319	265	101,566	92
East Flanders	89,919	270,409	300	122,614	136
Hainaut	150,028	289,544	193	113,966	76
Liege	101,948	220,563	216	101,398	100
Limbourg	65,987	142,266	215	64,526	98
Luxemburg	120,670	174,086	144	68,112	56
Namur	123,424	178,091	144	67,701	55
Whole Kingdom	*930,020*	*1,984,650*	*213*	*825,418*	*89*

It must be mentioned here that the above figures cannot be taken as absolutely correct and must not be considered such. In other words, the percentages as shown in the table, do not mean, for instance, that in the province of Antwerp forage cultures grown over 100 ha. are entirely consumed by 120 milch cows. In reality, together with cattle, there are other kinds of animals that benefit by such cultures, such as horses, pigs, muttons, etc. The figures given above indicate therefore only, for each province, the number of oxen and milch cows existing on 100 ha. of land cultivated to forages.

Taking as a basis an average yearly production of 2,500 litres of milk per cow, and on the other hand, the number of milch cows registered in the census of May 15, 1941, it can be estimated that the total milk production amounts to over 20.630.000 hectolitres, which means an average of 250 litres per inhabitant, considering that the population at 31 December 1940 amounted to 8.294.674 inhabitants.

CATTLE AND PIGS IN DENMARK *).

Cattle.

(Thousands)

CLASSIFICATION	Dec. 27 1941	July 12 1941	April 19 1941	March 3 1941	Nov. 2 1940	June 29 1940	Dec. 30 1939
Cattle	*2,833*	*3,004*	*3,068*	*2,976*	*2,976*	*3,226*	*3,186*
Calves under 1 year old	760	796	773	803	783	862	850
Bulls 1 year old and over	53	58	67	59	57	64	67
Steers	59	78	78	66	62	74	64
Heifers 1 year old and over	558	616	644	565	563	635	587
Cows and heifers having farrowed	1,403	1,456	1,506	1,483	1,511	1,591	1,618

Pigs.

(Thousands)

CLASSIFICATION	1941									1940
	Dec. 27	Nov. 15	Oct. 4	Aug. 23	July 12	May 30	April 19	March 8	Jan. 25	Dec. 13
Boars for breeding	9	9	10	11	11	11	11	11	11	11
Sows in farrow for first time	23	28	44	57	78	74	64	45	32	25
Other sows in farrow	69	68	79	86	85	87	87	93	100	103
Sows in milk	42	50	59	61	53	47	51	45	44	49
Sows not yet covered (and not for slaughter)	22	27	24	22	17	18	15	17	20	23
Sows for slaughter	16	21	18	10	7	8	7	11	14	17
Total sows	*172*	*194*	*224*	*236*	*240*	*234*	*224*	*211*	*210*	*217*
Sucking pigs not weaned	326	398	494	515	440	390	429	364	350	401
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg.	513	534	524	462	420	432	409	455	523	607
Pigs of 35 and under 60 kg.	424	416	401	399	405	366	419	473	503	516
Fat pigs of 60 kg. and over	247	374	360	317	254	288	333	359	371	437
Total pigs	*1,691*	*1.925*	*2,013*	*1,940*	*1,770*	*1,721*	*1,825*	*1,873*	*1,968*	*2,189*

*) Rural districts only.

LIVESTOCK PRODUCTS IN DENMARK.

PRODUCTS	1941	1940	1939
	thousand pounds		
Milk	7,143,001	9,314,562	11,629,423
Butter	273,374	359,355	403,447
Meat	363,764	445,335	337,308
Bacon	346,127	626,115	681,231
Eggs	108,027	213,849	297,625

DAIRY PRODUCTION IN SWITZERLAND.

The Swiss Dairy Commission has just issued the following provisional dairy statistics, for 1941:

		1941	1940	1939
Milk herds:				
Milch cows (census)	Number	862,742	910,005	926,400
Goats for milking (estimate)	»	158,199	157,000	146,000
Milk production:				
Cows (1941: 6,526 lb.; 1940: 6,550 lb.; 1939: 6,610 lb.. per year)	thousand lb.	5,778,000	6,102,000	6,268,000
Goats (1941: 926 lb.; 1940: 930 lb.; 1939: 930 lb. per year				
Milk deliveries at central stations (Brugg estimates):				
+ or — compared with the previous year		— 5.0 %	— 2.7 %	— 0.6 %
			Thousand lb.	
Utilization of milk:				
For feeding to livestock		880,000	990,000	1,100,000
For consumption in producers households		840,000	840,000	840,000
For sale to other consumers		1,522,000	1,439,000	[1]) 1,390,000
Exported		...	200	200
Imported		...	...	22,000
For processing (chese, butter, condensed milk, etc.)		2,537,000	2,834,000	2,960,000
Dairy products obtained:				
Cheese of all kinds		100,000	120,000	115,000
Butter of all kinds		53,000	55,000	63,000
Condensed milk and powdered whole milk		26,000	31,000	21,000

The deliveries of milk to dairies were 5 per cent. below those of last year. With the exception of January, deliveries were weaker each month. 880 million pounds of full milk were used for the fattening and raising of livestock (990 million pounds in 1940). Broadly speaking, 840 million pounds were used in the producers' honseholds. Total production was 5,8 million pounds:

[1]) Including 22,000 thousand pounds of imported fresh milk.

a figure which indicates a decrease of 5.3 per cent. as compared with 1940. This decrease corresponds almost exactly to the reduction of the number of cows (— 5.2 per cent.). If we consider that, according to the census of April 1941, the number of cows was 862,742 and the number of goats 148,199, and we suppose that (as compared with the year before) the goats' yield in milk (926 lb. per goat and year) may not have changed, we find that the average yield per cow and per year in 1941 amounted to 6.526 lb. (6,550 in 1940).

Milk used for livestock feeding was reduced by 110 thousand lb., as a consequence of the reduction of the number of cows which automatically carried with it a decrease in the number of calves, and also on account of a decree of the War Nutrition Office which, beginning November 3, 1940 limited the fattening of calves. Milk consumption in the cities that was not regulated until the second half of the year, increased 83 thousand lb., i. e., 7 per cent. as compared with 1940. For transformation were left 2,537 million pounds i. e., 10.5 per cent. less than in 1940.

In order to insure the necessary fat supply, the making of butter had to be maintained at a level not too far from that of 1940 (53,000 lb., against 55,000 lb. in 1940). This measure implied a considerable decrease in the making of cheese (100,000 lb., against 120,000 lb. in 1940) and in the preparation of condensed milk etc. (26,000 lb., against 31,000 lb. in 1940).

As regards the production of the various types of cheese, one may point out to the strong increase of lean cheeses which has nearly doubled, while the making of fat cheeses has almost ceased. A part of skimmed milk was not used for livestock feeding, but was turned over to the making of lean cheeses and was thus used for human nutrition.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Hungary: At the beginning of February, the condition of livestock was satisfactory.

Switzerland: A summary survey of the number of hogs existing in November 1941, showed that it was from about 140,000 to 180,000 lower than at the corresponding date in 1940. At the end of 1941 the number of hogs was between 820,000 and 860,000. As compared with the third year of the world war 1914/18, the number of hogs can be considered higher than in 1916.

Argentina: The sanitary condition of cattle is good all over the country, taken as a whole.

Japan: According to press information, in 1942 the number of hogs should have doubled. At the end of 1940 the total number of cattle was 2.06 million heads, of which 127,000 were milch cows. The raising of milch cows grows considerably. In order to get an idea of this increase, it must be remembered that at the end of 1940, on a total of 5.5 million agricultural holdings, there were 1.35 million farms with 1 head of cattle, 245,000 farms with 2-4 cattle heads, and 13,000 farms with 5 cattle heads or more. The raising of hogs is subdivided as follows: 317,000 farms with one pig, 121,000 with 2-4 pigs, and 15,000 with five pigs or more.

TRADE

Spain: Imports.

Imports of the most important cereals in Spain during 1941 and 1940 have been as follows:

Products and Units		1941	1940
Wheat	1,000 centals	10,322	14,860
	Thous. bush. of 60 lb.	17,202	24,766
Wheat flour	1,000 centals	272	689
	Thous. bbl. of 196 lb.	139	351
Maize	1,000 centals	8,145	706
	Thous. bush. of 56 lb.	14,545	1,261
Rice	1,000 centals	176	1,218
	Thous. bush. of 45 lb.	392	2,708

Romania: Exports.

Products and Units		November		Total from the begining of the season *)		Total of the season *)
		1941	1940	1941	1940	1940-41
Wheat	1,000 centals	55	0	55	15	18
	Thous. bush. of 60 lb.	92	0	92	25	30
Barley	1,000 centals	0	854	44	854	1,138
	Thous. bush. of 48 lb.	0	1,780	92	1,780	2,370
Maize	1,000 centals	2	141	2	141	3,305
	Thous. bush. of 56 lb.	4	252	4	252	5,902

Sweden: Imports.

Products and Units		December		Total from the begining of the season *)		Total of the season *)
		1941	1940	1941	1940	1940-41
Wheat	1,000 centals	0	93	1	277	277
	Thous. bush. of 60 lb.	0	155	1	461	461
Rye	1,000 centals	0	261	0	827	835
	Thous. bush. of 56 lb.	0	467	0	1,477	1,491
Oats	1,000 centals	0	46	52	156	695
	Thous. bush. of 32 lb.	0	143	163	486	2,172

*) Season beginning August 1st of the indicated year for wheat, rye, barley and oats; November 1st for maize.

Argentina: Export of wool.

During November 1941 Argentina exported 17,873 thousand lb. of wool, compared with 27,245 thousand lb. during November 1940. Exports during the 3 months period September 1st to November 30 amounted to 40,074 thousand lb. in 1941 and 56,904 thousand lb. in 1940.

Argentina: Imports.

Products and Units		September		Total from the begining of the season *)		Total of the season *)
		1941	1940	1941	1940	1940 or 1940-41
Oats	1,000 centals	1	0	3	1	11
	Thous. bush. of 32 lb.	3	0	9	2	34
Rice	1,000 centals	31	51	75	198	244
	Thous. bush. of 45 lb.	70	113	166	440	543
Cotton	1,000 centals	2	0	15	2	26
	Thous. bales of 478 lb.	0	0	3	1	5
Cheese	Thousand pounds	0	2	0	20	29
Cacao	Thousand pounds	456	705	1) 11,987	2) 11,352	—
Tea	Thousand pounds	443	637	842	1,387	3,545
Coffee	Thousand pounds	8,071	7,192	23,757	17,785	63,063

*) Season beginning January 1st of the indicated year for rice and cheese; July 1st for tea and coffee; August 1st for oats and cotton; October 1st for cacao.

1) 1940-41. — 2) 1939-40.

PRODUCTION — LATEST INFORMATION

Argentina (telegram of February 28): The condition of the maize crop is good. On the other hand, the condition of pastures and the sanitary state of livestock which last month were good, have grown worse on account of a severe drought in February.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	Feb. 13, 1942	Feb. 6, 1942	Jan. 30, 1942	Jan. 23, 1942	Monthly averages: Jan. 1942	Feb. 1941	Feb. 1940	Feb. 1939	Feb. 1938
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery May	80	80 1/4	80 7/8	80 5/8	79 5/8	77 5/8	86 3/4	62 1/2	127 3/4
,, July	81	81 1/4	81 3/4	81 5/8	80 5/8	79 1/4	87 3/4	63 1/8	119
,, October	—	—	—	—	—	—	88 3/4	63 5/8	99
Chicago (cents. p. 60 lb):									
delivery May	129 1/4	128 5/8	131 1/8	132 1/4	130 1/4	81 5/8	101 5/8	68 1/8	94 1/8
,, July	130 7/8	130 1/8	132 5/8	133 3/4	131 1/2	76 5/8	99 3/8	68 1/4	90
,, September	132 3/8	131 3/4	134 1/4	135 3/8	133 1/8	76 3/4	98 5/8	69	89 7/8
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery May	66 5/8	66 5/8	66 5/8	66 5/8	65 7/8	49 3/4	74 1/2	42 3/4	84 1/4
,, July	66 5/8	66 5/8	66 5/8	66 5/8	66 1/8	49 7/8	73 1/2	43 5/8	83 1/8
,, October	66 5/8	66 5/8	—	—	—	—	71 3/8	—	—
Chicago (cents p. 56 lb.):									
delivery May	86 7/8	85 3/8	87 1/2	88 1/8	83 3/8	43 1/8	67 3/4	45 3/8	75 1/2
,, July	89 1/4	87 3/4	90 1/4	90 1/2	85 3/4	44 5/8	67 1/2	46	70 5/8
,, September	91	89 3/8	92 1/4	92 1/2	87 3/8	45 1/2	68 1/4	47	67 7/8
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery May	64 1/8	64	64 3/4	63 5/8	62 5/8	47 1/8	54 1/4	37 5/8	65 1/4
,, July	62 3/4	63	64 5/8	62 5/8	61 3/4	44	52 3/8	36 7/8	60 1/4
,, October	60 3/4	60 5/8	63 7/8	60 5/8	60	—	50 3/4	—	—
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery May	50 1/8	49 1/4	51 3/8	50 7/8	49 7/8	35	40 3/4	29 1/4	49
,, July	49	n. q.	50 3/4	49 3/4	49	33 3/8	39	28 3/4	45 7/8
,, October	47 5/8	47 7/8	49 7/8	47 7/8	* 48 1/4	31 1/2	34 7/8	28 5/8	41 1/4
Chicago (cents p. 32 lb.):									
delivery May	57 1/8	56 1/2	59 1/8	59 7/8	58 3/4	35 1/4	40 1/4	28 3/8	31 1/4
,, July	57	56	58 3/4	59 1/2	58	31 3/4	35 3/8	27 1/8	29 1/4
,, September	56 3/4	56 1/2	58 3/4	59 1/2	57 7/8	31	33 1/4	26 3/4	29 1/8
Maize.									
Chicago (cents p. 56 lb.):									
delivery May	87	86 1/8	88 5/8	89 3/4	87	61	56 1/4	49 1/8	59 3/4
,, July	88 3/4	88	90 3/8	91 1/4	88 3/4	60 7/8	56 1/2	50 3/8	60 7/8
,, September	90 1/4	89 1/2	91 7/8	92 5/8	90 1/8	60 1/2	57 1/8	50 7/8	61 7/8

* Indicates that the product was not quoted during part of the period under review.

Description	Feb. 13, 1942	Feb. 6, 1942	Jan. 30, 1942	Jan. 23, 1942	Monthly averages				
					Jan. 1942	Feb. 1941	Feb. 1940	Feb. 1939	Feb. 1938
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery May	163 1/8	163	164	164	162 1/4	156 3/8	194 7/8	149 1/8	175 1/2
,, July	163 1/8	163 1/4	164	163 7/8	161 7/8	154 3/8	193	* 146 7/8	176 3/8
,, October	163 7/8	163 3/4	164	163 1/2	—	149 3/8	189 1/2	—	—

* Indicates that the product was not quoted during part of the period under review.

AVERAGE MONTHLY PRICES BY COUNTRIES.(1)

Groups	Description	Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1940	Oct.-Dec. 1939	Agricultural year (2) 1940-41	Agricultural year (2) 1939-40
	GERMANY (Prices in Reichsmarks per quintal).								
A I	Wheat (producer's price; Berlin)	20.60	20.40	20.40	20.07	20.20	20.20	20.50	20.50
	Rye (producer's price; Berlin)	18.90	18.70	18.70	18.37	18.50	18.50	18.80	18.80
	Barley, feeding (producer's price; Berlin)	17.20	17.00	16.80	16.40	17.00	17.00	17.22	17.22
	Oats (producer's price; Berlin)	18.20	18.10	18.00	17.98	18.10	17.40	18.28	17.65
	Potatoes, red (Berlin)	5.30	4.30	4.30	* 6.63	4.37	4.37	* 5.07	* 4.90
	Hops (Nürnberg)	480.00	470.00	480.00	446.67	463.33	455.33	451.15	* 457.60
A II	Oxen, live weight (Berlin)	86.20	88.20	88.60	90.53	88.33	88.33	81.17	87.20
	Calves, live weight (Berlin)	93.60	93.60	93.60	94.80	95.40	94.80	95.12	95.25
	Pigs, 220-265 lb., live weight (Berlin)	111.00	111.00	112.60	116.07	105.00	105.00	106.98	104.70
	Milk, fresh (Berlin) per hectolitre	19.10	19.10	19.10	19.10	19.10	n. q.	19.09	* 17.74
	Butter, National Mark (at dairy factory)	315.00	315.00	315.00	315.00	313.00	274.00	313.00	286.00
	Creamery butter (at dairy factory)	299.00	299.00	299.00	299.00	297.00	260.00	297.00	271.33
	Cheese, Emmenthal type (Kempten)	186.75	186.75	186.75	186.75	186.75	166.00	186.75	172.13
	Soft cheese, 20 % butterfat (Kempten)	65.25	65.25	65.25	65.25	65.25	58.00	65.25	60.36
	Eggs, aver. size, marked "G.I.B." (Berlin) per 100	12.50	11.50	10.50	10.50	11.50	11.50	10.88	10.88
B I	Basic slag, 16 % (Aachen) (3)	0.193	0.196	0.220	0.220	0.199	0.193	0.208	0.200
	Superphosphate of lime, 18 % (3-4)	0.301	0.298	0.314	0.310	0.304	0.304	0.309	0.309
	Potash salts, 40 % (4)	5.18	5.08	4.99	4.83	5.08	5.08	5.05	5.06
	Sulphate of ammonia, 21% (3-4)	0.465	0.455	0.445	0.433	0.455	0.450	0.454	0.451
B II	Wheat-bran (Hamburg)	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
	Rye bran (Hamburg)	10.25	10.25	10.25	10.25	10.75	10.75	10.75	10.75
	Oaten pods (Northern Germany)	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
	Potato flakes (Hamburg)	17.90	17.70	17.70	17.70	16.50	16.50	16.80	16.88
	Dried sugarbeet residue	11.81	11.81	11.81	12.93	11.81	11.81	12.33	12.32
	Rapeseed cake meal	14.22	14.22	14.22	14.22	14.22	—	14.22	* 14.22

* Indicates that the product was not quoted during part of the period under review. — n. q. = not quoted. — n. = nominal.
(1) Prices of plant (A I) and animal (A II) products sold by the farmer, also of fertilizers (B I) and concentrated feeding stuffs (B II) bought by the farmer. In cases where the market is not indicated, the price is the average for the whole country. — (2) July to June. — (3) Price per kg. of active fertilizer contained in 100 kg. of commercial fertilizer. — (4) Free at buyer's station.

Groups	Description	Average Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1941	Oct.-Dec. 1939	Agricultural year 1940-41	Agricultural year 1939-40

BELGIUM (Prices in Belgian francs per quintal)

Groups	Description	Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1941	Oct.-Dec. 1939	1940-41	1939-40
A I	Wheat (producer's price) (1)	205.00	210.00	212.00	203.35	170.00	142.70	170.10	*142.95
	Rye (producer's price) (1)	195.00	200.00	202.00	191.65	155.00	118.35	*155.00	*129.95
	Barley (producer's prices) (1)	185.00	185.00	185.00	173.35	150.00	157.60	*150.00	*159.85
	Oats (producer's price) (1)	180.00	180.00	180.00	168.35	145.00	95.65	*145.00	*104.65
	Potatoes (producer's price) (2)	75.00	75.00	75.00	*92.50	65.00	33.00	*71.40	*38.50
	Flaxen-straw (producer's price) (3)	150.00	150.00	150.00	150.00	150.00	138.65	*150.00	*146.20
A II	Oxen, live weight (producer's price)	1,025.00	1,025.00	1,025.00	1,025.00	808.00	—	*855.00	—
	Calves, live weight (producer's price)	1,125.00	1,125.00	1,125.00	1,125.00	858.00	—	*925.00	—
	Pigs, 220-265 lb., live weight (producer's price)	1,125.00	1,125.00	1,125.00	1,125,00	1,008.00	—	*1,055.00	—
	Dairy butter, whith quality mark (at dairy factory) (3)	3,100.00	3,100.00	3,100.00	3,100.00	3,100.00	2,080.00	*3,100.00	*2,165.00
	Farm butter (at farm) (3)	2,800.00	2,800.00	2,800.00	2,800.00	2,600.00		*2,620.00	
	Eggs (producer's price) (4) per 100	135.00	135.00	135.00	130.85	97.50	83,65	94.40	*68.55
B II	Meadow-hay (producer's price)	56.00	56.00	56.00	56.00	56.00	...	*56.00	...
	Clover-hay (producer's price)	70.00	70.00	70.00	70.00	70.00	...	*70.00	...
	Wheaten straw (producer's price) (3)	35.00	35.00	35.00	35.00	28.00	32.80	*31.85	*39.90
	Fresh sugar-beet pulp (sold to producers)	90.00	90.00	*90.00	n. q.	65.00	...	*65.00	...

DENMARK (Prices in Danish crowns per quintal).

Groups	Description	Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1941	Oct.-Dec. 1939	1940-41	1939-40
A I	Wheat (producer's price)	28.00	28.00	28.00	28.00	28.00	18.10	26.49	*18.36
	Rye (producer's price)	29.00	29.00	29.00	29.00	29.00	19.10	27.49	*19.36
	Barley (producer's price)	25.00	25.00	25.00	25.00	25.00	17.10	23.82	*17.36
	Oats (producer's price)	25.00	25.00	25.00	25.00	25.00	17.10	23.82	*17.36
	Potatoes (producer's price, Zealand)	13.40	14.12	14.55	14.50	13.89	7.00	*14.62	*9.37
A II	Cows, live weight (Köbenhavn)	95,00	101.75	106.10	113.70	80.67	47.42	83.83	50.99
	Pork, dead weight (producer's price)	244.00	244.00	237.60	236.00	218.53	179.33	219.90	180.23
	Fresh milk (producer's price)	23.46	23.46	23.46	23.46	23.06	14.77	22.18	15.57
	Butter (Köbenhavn)	389.00	389.00	389.00	389.00	385.00	250.87	374.56	252.76
	Whole milk cheese, 45 % (Odense) (5)	180.00	180.00	180.00	180.00	*257.50	151.33	*182.84	152.31
	Eggs, for export (producer's price)	260,00	240,00	222.40	205.47	197.03	157.17	173.57	122.33
B I	Superphosphate, 18 %	15.50	15.50	15.50	15.42	*13.55	6.67	*13.45	7.95
	Potash salts, 40 %	19.90	19.70	19.50	19.67	17.71	16.68	18.57	16.15
	Sulphate of ammonia, 20,8 %	24.10	23.90	23.65	23.65	21.93	17.75	21.75	17.70
	Nitrate of lime, 15 1/2 %	23.55	23.35	23.40	23.40	21.83	17.70	21.69	17.65
B II	Wheat-bran, Danish	n. q.	n. q.	n. q.	n. q.	23.75	18.30	*23.62	*16.82
	Buttermilkpowder	n. q.	n. q.	n. q.	n. q.	98.00	*82.00	104.11	*86.05
	Hay	35.80	34.25	34.00	33.20	30.87	10.28	*30.96	*10.83
	Oaten-straw	17.80	17.00	16.00	15.27	13.63	3.03	*14.41	*3.41

(*) Indicates that the product was not quoted during part of the period under review. – n. q. = *not quoted.* – n. *nominal.*
(1) Agricultural year 1939-40: prices at Antwerp market. — (2) Agricultural year 1939-40: prices at Louvain market. — (3) Before Sept. 1940: averages prices on the main markets. — (4) Agricultural year 1939-40: average prices on the main markets. — (5) As from january 1941: cheese with 20 % fat.

FRANCE (Prices in francs per quintal)

Groups	Description	Average: Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1940	Oct.-Dec. 1939	Agricultural year (1): 1940-41	1939-40
A I	Wheat (producer's price)	300.00	300.00	300.00	300.00	220.75	195.50	222.65	198.70
	Rye (producer's price) (1)	244.00	244.00	244.00	201.65	172.00	115.00	*174.50	*128.50
	Barley, malting (producer's price) (1)	229.00	229.00	229.00	190.00	162.00	112.35	*164.50	*114.75
	Oats (producer's price) (1)	214.00	214.00	214.00	175.00	147.00	*85.00	*149.50	*86.10
	Potatoes (Paris) (2)	...	177.50	177.50	228.50	...	...	...	...
	Flax, scutched, from Brittany	...	2,400.00	2,400.00	2,400.00	...	...	...	...
	Olive oil (Marseille) (2)	...	n. q.	n. q.	1,590.00	n. q.	*1,143.00	*1,595.00	*1,271.20
A II	Beef, dead weight, 1st quality (Paris)	...	1,800.00	1,800.00	1,800.00	...	1,222.00	...	*1,339.00
	Mutton, dead weight, 1st quality (Paris)	...	2,800.00	2,800.00	2,800.00	...	1,839.00	...	*1,977.00
	Pork, dead weight, 1st quality (Paris)	...	2,700.00	2,700.00	2,700.00	...	...	...	...
	Butter average quality (Paris)	...	3,795.00	3,766.00	3,780.00	...	...	...	...
	Cheese, hard and semi-hard (Paris) (2)	...	2,070.00	2,070.00	2,107.00	...	...	...	...
	Eggs (Paris) per 100 (2)	...	176.00	167.90	148.70	...	...	...	...

ITALY (Prices (3) in lire per quintal).

Groups	Description	Average: Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1940	Oct.-Dec. 1939	Agricultural year (1): 1940-41	1939-40
A I	Wheat, soft (producer's price)	175.00	175.00	175.00	175.00	155.00	135.00	157.90	135.00
	Wheat, hard (producer's price)	190.00	190.00	190.00	190.00	170.00	150.00	172.90	150.00
	Rye (producer's price) (4)	166.00	166.00	166.00	166.00	136.00	122.55	136.00	125.95
	Barley (producer's price) (5)	161.00	161.00	161.00	161.00	130.00	126.85	134.20	133.45
	Oats (producer's price) (6)	143.00	151.00	151.00	151.00	135.00	116.40	*135.00	136.35
	Maize (producer's price)	135.00	135.00	135.00	125.00	120.00	*108.00	118.00	*108.00
	Rice, rough, Maratelli (producer's price)	157.85	157.15	156.00	146.00	140.00	112.35	136.00	113.25
	Rice, Maratelli (f.o.r. rice-mill)	214.00	214.00	217.90	217.90	213.05	204.40	215.36	207.65
	Hemp, fibre	710.00	710.00	710.00	710.00	670.00	590.00	670.00	590.00
	Olive oil, fine (producer's price)	1.460.00	1,460.00	1.460.00	1,071.00	858.75	*777.00	857.40	*790.10
A II	Oxen, live weight, 1st quality (Milano)	525.00	516.00	536.65	*525.40	551.10	489.90	549.30	518.25
	Lambs, dead weight (Roma)	...	1,720.00	1.610.00	*1,125.00	1,016.95	708.05	*1,051.15	838.30
	Pigs, 400 lb. and more, live weight (Milano)	1,080.00	1,080.00	1,080.00	1,000.00	840.00	667.90	820.00	697.00
	Cheese, Parmigiano-Reggiano	...	...	1,520.00	1,480.00	*1,287.50	*1,088.00	*1,376.00	*1,215.00
	Eggs (Milano) per 100	135.00	135.00	135.00	131.00	99.55	71.65	90.50	64.40
	Wool, « Roma 2, Vissana » (producer's price)	3,274.00	3,274.00	3,274.00	3,274.00	3.141.00	2,602.00	3,156.50	2,646.90
B I	Superphosphate of lime, 14-16 % (Milano) (7)	38.20	38.20	38.20	36.20	29.11	24.75	29.90	*26.90
	Chloride of potash, 50 % (Milano) (7)	82.60	82.60	82.60	82.60	82.60	74.25	82.60	76.55
	Nitrate of lime, 15-16 % (Milano) (7)	117.90	116.00	114.10	113.90	113.00	91.85	114.15	*100.90
	Sulphate of ammonia, 20-21 % (Milano) (7)	109.85	108.90	107.95	107.40	105.90	87.30	107.15	*95.55
	Cyanamide of calcium, 15-16 % (Milano) (7)	125.20	123.70	122.70	121.05	113.55	92.75	115.20	*102.20
	Copper sulphate, 98-99 % (Genova) (7)	n. q.	n. q.	n. q.	n. q.	n. q.	n. q.	n. q.	*222.70
B II	Wheat-bran (at mill)	62.85	62.85	62.85	62,85	62.85	60.00	62.85	61.10
	Rice-bran (at rice-mill)	93.00	93.00	83.00	83.00	83.00	80.00	83.00	81.20
	Linseed cake (at oil-mill)	90.00	90.00	90.00	90.00	90.00	81.00	90.00	83.25
	Groundnut cake (at oil-mill)	75.00	75.00	75.00	75.00	75.00	65.00	75.00	67.50
	Rapeseed cake (at oil-mill	42.00	42.00	42.00	42.00	42.00	36.00	42.00	37.50

* Indicates that the product was not quoted during part of the period under review. — n. q. = *not quoted.* — n. = *nominal.*
(1) Agricultural year 1939-40: price at Paris market; as from October 1939 free in Département of production. — (2) Price end of month. — (3) As from January 1941: price at producer's premises. — (4) Agricultural years 1939-40 and 1940-41: Price Milan market. —(5) Before October 1940: price at Milan market. — (6) Agricultural year 1939-40: price at Milan market. — Including the 2 per cent. sales tax, levied as from February 8, 1940.

NETHERLANDS (Prices in florins per quintal).

Groups	Description	Average: Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1940	Oct.-Dec. 1939	Agricultural year 1940-41	Agricultural year 1939-40
A I	Wheat (producer's price)	13.47	13.71	13.64	* 13.57	11.81	10.69	12.05	10.98
	Rye (producer's price)	12.97	13.21	13.14	* 13.07	10.81	9.01	10.94	* 9.38
	Barley (producer's price)	11.72	11.96	11.89	* 11.82	10.31	9.00	10.33	* 9.00
	Oats (producer's price)	9.72	9.96	9.89	* 9.82	8.81	8.00	8.91	* 8.00
	Dry peas, green (producer's price)	15.22	15.46	15.39	* 15.32	12.68	9.75	12.54	* 9.75
	Rapeseed (producer's price)	20.45	20.31	20.18	* 20.02	16.81	15.00	16.90	* 15.00
	Linseed (producer's price)	15.45	15.31	15.18	* 15.04	14.31	10.00	* 14.63	* 10.00
	Potatoes (Amsterdam)	5.90	5.90	5.90	* 6.10	5.49	3.96	5.80	* 4.45
A II	Oxen, live weight (Rotterdam) (1)	63.00	63.00	63.00	63.00	63.00	76.67	* 63.00	78.92
	Pigs, live weight (Rotterdam)	71.00	71.00	71.00	71.33	68.00	64.00	69.00	60.50
	Milk, for industrial purposes (2)	9.10	9.10	9.10	8.70	7.38	...	7.12	...
	Butter, price for home consumption	230.00	230.00	230.00	230.00	187.67	157.50	183.00	151.00
	Cheese, Edam 40 + (Alkmaar)	112.00	112.00	112.00	112.00	69.12	48.84	69.28	42.18
	Eggs, fresh (producer's price) (3)	105.00	105.00	105.00	105.00	* 105.00	88.33	* 105.00	75.00
B I	Superphosphate, 14 % (Zwolle) (4)	3.90	3.90	3.90	3.77	2.89	2.16	* 4.44	2.17
	Kainite, 14 % (Zwolle)	1.85	1.83	1.80	1.76	1.71	1.65	1.71	1.64
	Sulphate of ammonia, 20 % (Zwolle)	7.00	6.95	6.85	6.67	6.15	5.30	6.18	5.54
B II	Linseed cake, Dutch (Rotterdam)	n. q.	n. q.	12.25	12.25	8.25	n. q.	10.65	* 8.51
	Meadow hay, 1st quality (producer's price)	5.35	5.35	5.35	5.30	5.30	...	5.30	...
	Straw, all sorts, pressed (producer's price)	2.04	2.02	2.02	2.07	...	...	* 2.04	...

SWEDEN (Prices in Swedish crowns per quintal)

Groups	Description	Average: Dec. 1941	Nov. 1941	Oct. 1941	July-Sept. 1941	Oct.-Dec. 1940	Oct.-Dec. 1939	Agricultural year 1940-41	Agricultural year 1939-40
A I	Wheat (Stockholm)	27.00	27.00	27.00	* 27.00	26.69	19.57	25.26	* 19.79
	Rye (Stockholm)	27.00	27.00	27.00	* 27.00	26.64	19.40	25.22	* 19.63
	Barley	26.00	26.50	27.00	* 27.00	25.28	17.37	* 24.43	* 16.50
	Oats (Stockholm)	22.50	23.00	23.50	* 23.50	22.89	14.80	* 22.32	* 16.15
	Dry peas, yellow (producer's price)	50.00	50.00	50.00	* 50.00	46.61	39.83	* 47.29	* 37.64
	Potatoes, 1st quality (Stockholm)	13.00	12.56	12.65	* 12.40	10.88	9.13	* 11.12	* 12.68
A II	Beef, of cow and oxen (Stockholm)	182.00	182.00	182.00	182.00	135.00	124,53	151.21	128.40
	Pork (Stockholm)	209.00	208.00	207.00	207.00	192.00	150.13	191.07	152.41
	Butter (Malmö; prices for the home market)	405.00	405.00	371.00	355.00	374.67	300.00	369.08	300.00
	Eggs (Stockholm) (producer's price)	273.00	273.00	230.00	231.80	209.17	178.67	192.46	150.46
B I	Superphosphate, 20 %	10.00	10.00	10.00	* 10.00	9.95	n. q.	9.95	8.62
	Potash salts, 40 %	15.60	15.60	15.60	* 15.60	n. 15.24	n. q.	15.38	14.62
	Nitrate cyanamide, 15 ½ % (5)	20.25	20.25	20.25	* 20.25	n. 20.12	n. q.	19.67	16.81
B II	Wheaten bran	16.50	16.50	16.50	16.50	16.50	20.69	16.67	15.63
	Rye bran	16.50	16.50	16.50	15.75	15.50	15.06	15.67	14.60
	Feeding cellulose	12.00	12.50	12.00	15.37	* 18.00	—	* 17.91	—
	Concentrated feeding mixture 48 %	30.00	30.00	30.00	24.04	23.50	23.50	23.50	23.10
	Meadow hay, good quality (producer's price)	18.00	18.00	18.00	20.67	* 24.84	8.37	* 22.86	* 9.07
	Wheaten straw, good quality (producer's price	6.00	6.00	6.00	6.00	* 7.35	* 2.54	* 6.65	* 2.91

* Indicates that the product was not quoted during part of the period under review. — n. q. = *not quoted.* — n. = *nominal.*

(1) Before Oct. 1940: beef, dead weight. — (2) **Before July 1941: Price at farm in Friesland for milk with 3.3 % butter-fat.** — (3) Before Nov. 1940: price at Barneveld market. — (4) **As from Jan. 1941: superphoshate 17 %.** — (5) As from July 1941: calcium cyanamide 18 %.

APPENDIX

AGRICULTURAL CENSUSES IN BELGIUM IN 1941

During the year 1941 the Central Statistical Bureau of Belgium took two censuses interesting agriculture.

Following a decree of 6 December 1940, on January 1, 1941 a census was taken of winter sowings and livestock. The declaration for the census was

I. — *Distribution of crops.*

Crops	Area (acres)	
	1941	1929
Winter wheat	390,138	369,589
Spring wheat	49,021	11,016
Rye	310,142	454,871
Winter barley	39,110	39,982
Spring barley	35,309	21,691
Spelt	19,324	16,764
Meslin	6,269	6,842
Oats	413,196	560,970
Buck wheat	2,387	1,871
Other cereals	2,881	—
Total	*1,267,777*	*1,483,596*
Leguminous crop for grain (beans, peas, etc.)	*42,298*	*29,752*
Potatoes late and semi-early	250,611	328,971
Potatoes early	8,812	43,289
Mangels	200,492	201,540
Fodder carrots	2,748	4,601
Other root crops	9,195	13,907
Total of tuber and root crops	*471,858*	*592,308*
Fdder crops	*1,972,498*	*1,949,003*
Hemp	148	171
Flax crops	43,555	61,458
Tobacco	7,628	5,889
Hops	1,399	2,639
Chicory for coffee	12,378	15,761
Sugar beet	119,408	130,822
Other crops for industrial purposes	1,646	623
Total of crop for industrial purposes	*186,162*	*217,363*
Vegetable crops	55,580	112,420
Fruit crops	123,582	169,092
Flowers	1,871	2,249
Other crops (nurseries, osiers, etc.)	12,785	22,675
Fallow and uncultivated land	(1) 50,376	206,334
Total	(1) *244,194*	*512,770*
GENERAL TOTAL	(1) **4,184,787**	**4,784,792**

(1) Not including uncultivated land belonging to the State, to the Provinces and to the Communes.

II. — *Livestock, poultry and bee-hives* (number).

Classification	May, 15 1941 (1)	January, 1 1941 (1)	Decemb., 31 1929 (1)	Decemb., 31 1929 (2)
Horses:				
Horses used in agriculture				
Colts under 1 year	28,675	—	—	23,883
From 1 year to under 3 years old	57,462	—	—	51,550
From 3 years to under 4 year old	16,605	—	—	194,359
From 4 year to under 9 years old	38,360	—	—	
From 9 years old and over	98,786	—	—	
Total	*239,888*	—	—	*269,792*
Horses not used in agriculture	*32,712*	—	—	*50,544*
General total	**272,600**	**285,764**	**316,855**	**320,336**
Asses	4,835	5,617	12,588	6,405
Mules and hinnies				6,212
Cattle:				
Under 3 months old	289,860	—	—	270,904
From 3 months to under 1 year old:				
Males	105,517	—	—	
Females	232,129	—	—	
From 1 year to under 2 years old:				
Young bulls used for service	21,501	—	—	74,889
Other cattle:				
Males	73,946	—	—	
Females	249,483	—	—	211,741
Total	*972,436*	*852,263*	—	*557,534*
From 2 years old and over:				
Bulls used for service	7,068	(3) 22,472	—	9,763
Draught oxen	19,331		—	13,757
Heifers	128,012	108,911	—	123,716
Cows:				
exclusively milk cows	742,146	764,856	—	916,282
milk and draught cows	83,272	68,869	—	
other (animals for slaughtering and for fattening)	16,795	10,810	—	51,567
Other bulls and oxen	15,590	—	—	
Total	*1,012,214*	*975,918*	—	*1,115,085*
General total	**1,984,650**	**1,828,181**	**1,606,936**	**1,672,619**
Sheep	**197,998**	**153,144**	**185,281**	**187,351**
Goats	**130,205**	**116,190**	**157,767**	**157,963**
Pigs:				
Under 8 weeks old	121,958	491,644	—	449,687
From 8 weeks to under 6 months old	217,154		—	
Boars	5,597	5,474	—	3,899
Breeding sows:				
from 6 months to under 1 year old:				
full	39,594	119,036	—	124,793
emptiness	34,519			
from 1 year old and over:				
full	38,360			
emptiness	25,074			
Other pigs (animals for slaughtering and for fattening):				
from 6 months to under 1 year old	17,419	16,680	—	414,826
from 1 year old and over	2,295			
Total	***501,970***	***632,834***	***966,186***	***993,205***
Rabbits	**1,082,650**	**764,302**	**1,528,371**	**1,529,650**
Poultry:				
Laying hens	3,114,241	4,195,693	—	16,917,222
Cocks, chickens and Capons	167,353	239,223	—	1,290,300
Total	**3,281,594**	**4,434,916**	**16,693,433**	**18,207,522**
Bee-hives	**51,134**	—	—	**58,520**

(1) Actual territory. — (2) Including 30 communes of the cantons of Eupen, Malmédy and Saint With. — (3) Including other bulls and oxen.

obligatory for whomsoever, at January 1, 1941 cultivated at least one are (1,076,400 square feet) sown to winter wheat, rye, spelt, meslin or winter barley, or kept horses, asses, mules and hinnies cattle, sheep, pigs, goats, rabbits and poultry.

Later, following a decree of 2 May 1941, the Central Bureau of Statistics, on 15 May 1941, took an agricultural and horticultural census. All physical and moral persons that, at 15 May 1941 worked at least one are sown to crops indicated in the census form or possessed horses, asses, mules, cattle, sheep, pigs, goats, rabbits, poultry and bees, were subject to the census.

Declarations for each of the two censuses were received by census agents appointed for this purpose by the burgmeister, at the holding, in the house or establishment where animals to be registered were kept.

The census of May 15, 1941, considering its wide scope, can be compared in a way to the general agricultural census of 31 December 1929. The fact that the census of livestock was taken at two different periods of the year (January 1 and May 15) serves to emphasize some interesting peculiarities of the season.

A summary of the results of the two censuses, published by the Central Bureau of Statistics [1], is given in the preceding tables. The tables contain also for a usuful comparison the corresponding data of the Agricultural Census of 1929. Figures for 1929 do not include the data relating to Communes which are no longer under the Belgian administrative jurisdiction.

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(1) See: Bulletin of Statistics, published by the Central Bureau of Statistics, June 1941, No. 6, and August 1941, No. 8.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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Area and Production of Cereals.

COUNTRIES.	AREA					PRODUCTION							
	1941	1941	Aver. 1935 to 1939	% 1941		1941	1940	Aver. 1935 to 1939	1941	1940	Aver. 1935 to 1939	= 1941	
	000 acres			1940 = 100	Aver. = 100	000 acres			000 bushels			1940 = 100	Aver. = 100
Algeria	...	...	3,058	...	...	15,360	7,920	15,415	32,000	16,500	32,114	193.9	99.6
Egypt	255	268	278	95.1	95.1	4,699	5,315	7,339	9,789	11,073	15,290	88.4	64.0
Tunisia	...	...	1,174	...	...	4,400	2,000	4,564	9,186	4,134	9,508	222.2	96.6
Argentina	(5)1,972	(5)2,139	(5)1,903	92.2	103.6	8,444	17,395	11,329	17,591	36,239	23,602	48.5	74.5
Chile	128	128	184	99.9	69.5	...	...	2,419	...	...	5,041	...	...
Uruguay	67	54	(6) 36	122.7	—	...	216	(6) 259	...	450	(6) 539	...	...
New Zealand	30	26	24	115.4	125.5	550	481	461	1,146	1,002	961	114.4	119.2
OATS													
Belgium	413	...	548	...	75.4	...	...	14,074	...	...	43,982	...	...
Denmark	846	843	926	100.3	91.4	16,314	19,641	22,303	50,982	61,378	69,697	83.1	73.1
Spain	1,646	1,597	(1)1,423	103.1	115.7	12,469	10,459	(1)10,549	38,964	32,685	(1)32,966	119.2	118.2
Finland	1,055	1,054	1,142	100.1	92.4	10,626	11,128	15,974	33,207	34,776	49,917	95.5	66.5
Ireland	779	681	571	114.4	136.5	...	16,222	12,565	...	50,694	39,265	...	...
Slovakia	370	365	(3) 333	101.5	131.3	...	4,596	(3) 3,660	...	14,363	(3) 11,437	...	...
Sweden	1,553	1,569	1,641	99.0	94.7	17,139	20,660	27,904	53,459	64,563	87,199	83.0	61.4
Switzerland	80	53	28	150.2	286.3	...	1,140	510	...	3,562	1,593	...	...
Canada	13,841	12,298	13,246	112.6	104.5	120,138	129,379	114,94	375,430	404,309	359,201	92.9	104.5
United States	37,236	34,847	35,417	106.9	105.1	364,430	395,401	329,369	1,138,843	1,235,628	1,029,279	92.2	110.6
Algeria	...	...	470	...	...	2,560	...	3,387	8,000	...	10,585	...	75.6
Argentina	(5)3,519	(5)3,899	(5)3,567	90.2	98.1	10,362	11,894	16,254	32,380	37,168	50,795	87.1	63.7
Chile	168	198	279	85.3	60.3	...	...	2,455	...	...	7,670	...	...
Uruguay	237	225	213	105,5	111.2	...	421	992	...	1,316	3,100	...	...
New Zealand	60	61	63	98.4	95.4	1.080	1,120	1,174	3,375	3,500	3,669	96.4	92.0

(*w*) Winter crop. — (*s*) Spring crop. — (1) Year 1939. — (2) Not including territories transferred in 1940. — (3) Average of two years — (4) Final estimate except for 1941 area, the figure of which is that of the fourth estimate. — (5) Area sown. — (6) Not including barley for brewery.

Switzerland: Undoubtedly, this year again, the demand for spring cereal seeds will be quite abundant. Wheat selectors and their syndicates have prepared for sale large quantities of cereal seeds drawn from controlled fields. Besides, the Wheat Administration has at its disposal a good reserve of wheat Huron. The small available quantities of spring rye seeds will be attributed, first of all, to mountaineous regions. On their side, the central bureaus for home produced cereals, have gathered during the winter, in exchange of forage stocks, good amounts of oats, barley and maize which can be used as additional seeds. In all cases where cereals from visited cultures are lacking, it will be necessary to substitute them, as far as possible, with these additional seeds.

CURRENT INFORMATION ON MAIZE.

Bulgaria: According to unofficial information, weather conditions in 1941 were not favourable to the growth of the maize crop, which suffered much from the cold in the Autumn months. The 1941 maize production, however, was rather good.

Italy: The production of maize in 1941 is estimated at 57,951,000 centals (103,485,000 bushels) against 75,577,500 (134,960,000) in 1940 and an average of 63,779,500 (113,892,000) in 1935 to 1939; percentages, 76.7 and 90.9.

Argentina: According to the second official estimate published on March 6 the area sown to maize in 1941-42 amounted to 12,300,000 acres against 15,067,700 in 1940-41 and an average of 16,000,000 acres in the five preceding years: percentages, 82.0 and 77.4. The strong decrease registered this year must be attributed to the Government limitation policy of the culture of maize. This policy has been dictated by the fact that stocks existing in the country are very heavy and export difficulties are quite exceptional.

The condition of the maize crop in February was good. The first official estimate on this year maize production will be published next month.

CURRENT INFORMATION ON RICE.

Italy: The production of rice in 1941 is estimated at 18,271,500 centals (40,602,500 bushels) against 20,475,500 (45,500,100) in 1940 and an average of 16,929,500 (37,620,300) in 1935 to 1939; percentages, 89.2 and 107.9.

Argentina: The second official estimate of the area sown to rice in 1941/42 confirms the previous forecast. It amounts now to 83,000 acres against 75,300 thousand acres in 1940-41 and 70,000 as an average during the five preceding years: percentages: 109.5 and 118.1.

Taiwan: The production of rice (second crop) in 1941-42 is estimated at 17,200,000 centals (38,190,000 bushels) against 15,060,000 (33,460,000) in 1940-41 and an average of 20,038,000 (44,529,000) in 1935-36 to 1939-40; percentages, 114.0 and 86.0.

Japan: The production of rice in 1941-42 is estimated at 225,500,000 centals (500,000,000 bushels) against 249,200,000 (553,730,000) in 1940-41 and an average of 260,140,000 (578,000,000) in 1935-36 to 1939-40; percentages, 90.5 and 86.7.

CURRENT INFORMATION ON POTATOES.

Belgium: In order to constitute a good reserve of potatoes for a period of eight months beginning November 1942, everybody is authorised to sign a contract with any farmer and without any territorial limitation for the delivery, from the 1942 crop, of 265 lb. at the utmost of potatoes for each person of his family. Deliveries under contract may be effectuated by drawing them from the amount which the producer must grow according to the culture plan.

It must be remarked however, that in no case these deliveries under contract will be allowed to draw from the supply which must be delivered, before all, to the Potatoes Pooling of a minimum of 71.4 centals or 119.0 bushels per acre sown to this product. This priority delivery does not extend to crops sown on a larger area than that foreseen by the plan of culture.

Bulgaria: Owing to an increase in the consumption of potatoes which, in many cases, replace bread, the Bulgarian Government has taken measures to have an increase of area to be devoted to the potato crop in the coming Spring. According to a special plan added to the general plan for an increase of Spring crops, all villages situated along the slopes of the Balkans must double their areas to potatoes. Areas

sown to the same crop will be increased also in the districts recently annexed by Bulgaria, wherever general conditions are favourable. The Agricultural Cooperative Bank of Bulgaria will provide farmers with the necessary seeds. In the new regions will be sown for the first time a new variety of potatoes known as 'binte'.

Greece : At the beginning of February, the Agricultural Bank of Greece, through its branches, distributed to te farmers great quantities of potatoes for the new seeding. Prices practiced were very low. Farmers also received propaganda leaflets encouraging the increase of areas to be devoted to potato crops.

Serbia: It is foreseen that there will be an increase of area to potatoes. In fact, according to unofficial information, the area to potatoes this year should amount to from 160,000 to 175,000 acres. This figure is about one fourth of the total area sown to potatoes in former Yugoslavia.

CURRENT INFORMATION ON SUGAR.

Finland: According to a comunication of finnish sugar producers the area cultivated to sugarbeets in 1942 would be about 5,800 acres against 8,300 in 1941.

Italy: According to the program prepared by the Ministry of Agriculture, the area to be sown to sugar beets should reach 408,000 acres. If this figure is not reached after farmers have made their plans known, the Ministry of Agriculture will study the means to have at least an area sown to sugar beets equal to last year, *i. e.*, 383,000 acres.

Production of Beet-Sugar (raw).

COUNTRIES	TOTAL PRODUCTION DURING THE SEASON						% 1941-42	
	1941-42 (1)	1940-41	Average 1935-36 to 1939-40	1941-42 (1)	1940-41	Average 1935-36 to 1939-40	1940-41 = 100	Average = 100
	thousand centals			short tons				
Belgium	5,467	5,633	5,154	273,000	281,600	257,721	97	106
Bulgaria	(2) 1,235	(2) 1,052	476	(2) 62,000	(2) 52,579	23,798	117	259
Croatia	(2) 419	(2) 383	—	(2) 21,000	(2) 19,161	—	109	—
Denmark	6,283	5,490	4,949	314.000	274,000	247,463	114	127
Spain	4,079	3,530	3,251	204,000	176,497	162,545	115	125
Finland	(3) 91	165	257	(3) 4,557	8,233	12,836	55	36
France	(3) 15,310	(3) 10,377	20,513	(3) 765,486	(3) 518,857	1,025,635	148	75
Italy	10,053	13,387	8,350	503,000	669,330	417,471	75	120
Latvia	(3) 577	(3) 1,118	979	(3) 28,850	(3) 55,913	48,970	52	59
Lithuania	(3) 522	(3) 729	541	(3) 26,099	(3) 36,457	27,069	72	96
Romania	(3) 1,837	1,881	2,798	(3) 91,858	94,031	139,891	—	—
Serbia	(3) 799	(4) 2,425	(4) 1,913	(3) 39,928	(4) 120,000	(4) 95,665	—	—
Slovakia	1,459	(5) 1,407	(3) 1,190	72,930	(5) 70,333	(5) 60,000	104	123
Sweden	6,878	6,855	6,805	344,000	342,770	340,241	100	101
Switzerland	(3) 422	408	251	(3) 21,079	20,400	12,536	103	168
United States	(3) 30,600	37,758	30,409	(3) 1,530,000	1,887,903	1,520,407	81	101
Japan	882	643	949	40,000	34,657	47,451	127	93
Turkey	2,110	2,150	1,509	105,519	107,514	75,468	98	140

(1) Approximate data. — (2) Licht's estimate — (3) Data of International Association for Sugar Statistics. — (4) Former Yugoslavia. — (5) Season 1939-40.

Serbia: According to the plan of the Ministry of Agriculture, the area sown to sugar beets this year should amount to 37,000 acres.

Slovakia: According to press information the sugar season 1941-42 proceeded in the following manner. The sprouting of seeds was delayed by unfavourable weather during the whole vegetative period. Bad weather hindered also works in the fields and

Production of Cane-Sugar.

COUNTRIES	1940-41 (1)	1939-40	Average of 1934-35 to 1938-39	1940-41 (1)	1939-40	Average of 1934-35 to 1938-39	% 1940-41: 1939-40 = 100	% 1940-41: Average = 100
	000 centals			short tons				
AMERICA.								
Antigua	540	309	520	27,000	15,000	25,984	175	104
Argentina	11,865	11,499	8,804	593,245	574,953	440,171	103	135
Barbados	1,698	1,587	2,718	85,000	79,000	135,905	107	62
Brazil	28,338	26,277	23,231	1,416,900	1,313,800	1,161,530	108	122
Colombia	1,060	904	809	53,010	45,000	40,428	117	131
Cuba	(2) 54,678	63,163	60,266	(2) 2,733,880	3,158,000	3,013,269	87	91
United States (La. & Fl.)	6,729	10,392	8,528	336,453	519,597	426,400	65	79
British Guiana	4,255	3,748	4,233	213,000	190,000	211,669	114	101
Dutch Guiana	331	245	359	17,000	12,240	17,967	135	92
Jamaica	3,492	2,227	2,289	174,600	111,000	114,455	157	153
Martinique	1,213	1,323	1,167	61,000	70,000	58,359	92	104
Mexico	7,275	6,547	6,763	360,000	327,360	338,128	111	108
Paraguay	273	240	(3) 152	13,700	12,000	(3) 7,604	114	180
Peru	10,373	8,897	8,426	518,659	444,829	421,291	117	123
Puerto Rico	18,629	20,375	17,748	931,000	1,018,700	887,390	91	105
Dominican Republic	8,818	10,027	9,339	440,873	501,366	466,926	88	94
St. Kitts	851	692	700	42,500	34,600	34,977	123	122
St. Lucia	227	180	180	11,330	8,990	9,008	126	126
Trinidad	2,734	2,065	3,086	137,000	103,250	154,308	132	89
Venezuela	611	542	514	30,500	27,100	25,706	113	119
Total America	*163,990*	*171,239*	*159,832*	*8,196,650*	*8,566,785*	*7,991,475*	*96*	*103*
ASIA.								
Taiwan	17,593	26,630	23,776	880,000	1,331,500	1,188,782	66	74
India	77,698	74,120	72,761	3,884,800	3,706,000	3,638,000	105	107
Japan	2,205	3,386	2,751	100,000	169,300	137,560	65	80
Java	37,599	35,385	23,832	1,879,946	1,769,236	1,191,582	106	158
Philippines	(2) 21,839	(2) 21,065	21,141	(2) 1,091,900	(2) 1,053,200	1,057,042	104	103
Total Asia	*156,934*	*160,586*	*144,261*	*7,836,646*	*8,029,236*	*7,212,966*	*98*	*109*
AFRICA.								
Egypt	3,836	3,524	3,213	192,000	176,198	160,668	109	119
Mauritius	6,972	5,059	6,150	348,600	252,930	307,505	138	113
Reunion	2,441	1,622	1,782	122,000	81,100	89,098	150	137
Union of South Africa	11,463	11,839	10,010	570,000	592,000	500,515	97	115
Total Africa	*24,712*	*22,044*	*21,155*	*1,232,600*	*1,102,228*	*1,057,786*	*112*	*117*
OCEANIA.								
Australia	18,010	20,787	16,607	900,500	1,039,400	830,341	87	108
Hawaii	19,379	19,028	19,112	969,000	951,400	955,596	102	101
Fiji Islands	2,654	2,557	2,973	132,677	128,000	148,630	104	89
Total Oceania	*40,043*	*42,372*	*38,692*	*2,002,177*	*2,118,800*	*1,934,567*	*94*	*103*
TOTALS	**385,679**	**396,241**	**363,940**	**19,268,073**	**19,817,049**	**18,196,794**	**97**	**106**

(1) Approximate data. — (2) Willet & Gray estimate. — (3) Average of two years.

beet pulling. The season started in the second half of October. Production amounted to 1,288,000 centals (64,000 sh. tons) of white sugar and 25,600 centals (1,300 sh. tons) of raw sugar. The production of molasses amounted to 267,000 centals (13.300 sh. t) The amount of sugar beets utilized for this production was 8,292,000 centals (414,600 sh. tons).

Mexico: According to F. O. Licht, the production of cane sugar in 1941/42 will amount to 8,280,000 centals (415,000 short tons). This figure indicates a heavy increase as compared with 1940/41. Government measures in favour of cane sugar growers and refiners is responsible for this considerable increase. Following the Government's example, several refiners have helped sugar cane producers with loans.

Turkey: Following a general rise in prices, Government orders have provided also for an increase of the price of sugar beets, which has been set at 2.50, 2.75 and 3 piastres per kg., according to the different regions of production. These prices will be paid by sugar factories as long as the general tendency of the market may not require a further rise.

WORLD OIL PRODUCTION IN 1941-42

by Dr. M. Costa

The most recent information on oil production in Spain, which, as it is known, averages nearly 40-45 per cent. of the world total, shows that in the provinces of Jaén, Albacete and Lerida some damage was caused by frost and its volume reduced thereby. Harvest was good in the provinces of Castellon and Tarragona, while in the provinces of Murcia, Salamanca and Logroño results were unsatisfactory. On the whole, the course of the season was normal; but the Summer and Autumn drought, the hot winds which caused the fall of a considerable amount of olives, maladies and pests have reduced the expectations of as rich a crop as had been justified by the excellent condition of flowering. It is officially estimated that olive oil production in Spain may be of about 7.0 million centals, (94.1 million American gallons); i. e., considerably higher than the poor one of the year 1940-41 (6.3 million centals = 82.3 million American gallons) and practically but a little lower than the average of the five years 1935-36 to 1939-40. In order to steady the olive oil market, the whole of the 1941-42 olive oil production in Spain was put under the control of the " Comisaría General de Abasteciemientos y Tranportes". Producers received 0.4 centals of oil (5.9 Am. Gallons) per year and head for their personal use. A number of measures were also taken to regulate oil consumption. Spanish provinces have been classified in four groups: provinces that produce no oil; provinces that produce an insufficient amount of oil; provinces that produce a sufficient quantity and provinces that have a surplus production as compared with home needs. The quantities allowed to each province are fixed month by month. At the beginning of the present season (November 1, 1941-October 31, 1942), the prices of olive oil were fixed as follows: base price to the producer for the duration of the season, 360 pesetas per

quintal for ordinary oils having 3 degrees of acidity; ordinary oils (acidity 4-5 degrees) are charged 5 pesetas less per quintal and degree; from 5 degrees onward, the reduction of price is of only 2.50 pesetas per quintal and degree. Oils having an acidity under 3 degrees are subject to an increase of 10 pesetas per quintal and degree. The price of oils with an acidity not above 1 degree has been set at 415 pesetas per quintal.

Production of olive oil *

(thousand centals).

Countries	1941-42	1940-41	Average 1935-36 to 1939-40
Spain	7,001	6,262	7,531
Italy	4,409	3,197	5,038
Greece	2,205	2,187	2,674
Portugal	1,468	760	1,258
Turkey	882	661	977
Tunisia	772	661	920
Algeria	551	187	254
French Morocco	331	331	287
Totals	*17,619*	*14,246*	*18,645*
WORLD PRODUCTION	18,500	14,925	19,738

* Data for 1941-42 are mostly unofficial estimates. The total production of countries included in the table represents, as an average, 95-96 % of world production.

The damage caused by the civil war in Spain has had an enormous repercussion on the number of livestock heads, particularly as regards pigs. It is calculated that the number of pigs in 1939 had fallen below 3 million heads, against over 5 million heads in 1933. This decrease has contributed to the want of animal fats and consequently to an increased demand for vegetal fats, especially olive oil. At present Spain does not export any olive oil, on the contrary, home needs are above available stocks, especially in view of the fact that the Spanish production of oils from other oleagineous seeds is of little importance (groundnuts for instance, are cultivated almost exclusively in the province of Valencia and total production amounts to hardly 441,000 centals). It is estimated, therefore, that the production of this year will be barely sufficient to fill the needs of the home market, while the country does not dispose of important surplus olive oil stocks from previous years.

The production of olive oil in Italy this year is estimated considerably greater than the very poor one of the year 1940-41 which amounted to only 3,197,000 centals (42,623,000 Am. gallons). Production this year may reach 4.4 million centals (58.8 million Am. gallons) a figure which, for Italy, indicates an average crop. In the most important oil producing zones the course of the season was, on the whole, favourable. No severe damages were caused by insects and maladies. In order

to produce the largest possible amount of oil, during the 1941-42 season the preparation and drying of olives of all qualities destined to direct consumption has been forbidden. An exception has been made for the "Ascolana" olive, produced in the province of Ascoli. Producers are obliged to deliver to collective storage plants all the oil produced in 1941-42. The maximum quantity of olive oil that producers are allowed to keep for themselves has been fixed at 0.2 centals (2.9 Am. gallons) per head and year. Prices which collective storage plants will pay this year to producers have been fixed in the following measure: L. 1550 per quintal for oil having an acidity up to 0.8 degrees; L. 1500 for oil up to 1.5 degrees; L. 1460 for oil up to 2.5 degrees; L. 1440 for oil up to 3.5 degrees; L. 1420, up to 5 degrees, and L. 1400 up to 7 degrees.

The olive oil production in Greece is estimated average (about 2.2 million centals = 29.4 million Am. gallons). No free trade of olive oil is allowed and its distribution is under the control of the Ministry for Nutrition.

In Portugal, the oil season commenced under favourable conditions: flowering was abundant and vegetation in the Spring was generally regular. During Summer, hot winds and drought did considerable damage and in some zones the fall of young fruit was important. Yields however were good, (1,5 million centals = 19.6 million Am. gallons) greater than the very low ones of the year 1940-41 (760,000 centals = 10,288,000 Am. gallons), and better than average (average for the five years 1935-36 to 1939-40, 1,258,000 centals (16.755.000 Am. gallons).

In the French territories of North Africa, production was variable. Results do not seem good in Tunisia, where the olive oil production is estimated of about 772,000 centals (10,288,000 Am. gallons) and therefore below average. In Algeria production has been good: 551,200 centals (7,348,700 Am. gallons) i. e., quite above normal. In Morocco production has been almost average: 330,700 centals (4,409,200 Am. gallons) with high yields in the southern regions and rather low ones in the northern part of the country.

In Tunisia the oils of the 1941-42 and previous crops have been blocked and put at the disposal of the Purchase Committee for the assessment of the olive oils of Tunisia which has fixed the following sale prices: olive oil, extra quality, frs. 1500 per quintal; first quality, 1420 frs. second quality, 1360 frs.; "bouchable" 1315 frs.; unrefined, base 5 degrees, 1225 frs.

In Turkey, the season was good, especially in the economic region of Izmir. No severe damages were caused by bad weather and parasites. The production of olive oil is estimated at almost 881,900 centals (11,758,000 Am. gallons) i.e., above that of 1940-41 (661,400 centals = 8,818,500 Am. gallons), but somewhat lower than the average of the years 1935-36 to 1939-40 (976,700 centals = 13,022,000 Am. gallons).

All in all, the Institute estimates that the 1941-42 olive oil production was rather good. Yields were perhaps a little below average, but considerably above those of the rather weak production of 1940-41. With all reserves due to the lack of many official data, the present world production of olive oil is estimated at 18.5 million centals (246.9 million Am. gallons) against 14.9 (199.0) in 1940-41 (24.1 per cent. more) and 19.7 (263.2) as an average during the five years 1935-36 to 1939-40 (6.2 per cent. less).

In normal times, 75 per cent. of the total production of eatable oil was consumed in the large producing countries and 25 per cent. (i. e., about 4.4 million centals = 58.8 million Am. gallons) was put on the international market. The trade was carried on almost exclusively by sea, because the American countries, especially Argentina and the United States, imported most of the exportable surpluses available in the producing countries. The war now going on, has almost completely stopped the international trade in olive oil, not only on account of the difficulties of maritime transportation, but above all on account of the needs of home consumption in the oil producing countries which, owing to the scarcity of other fats, must rely in their national production of vegetal oils in a larger measure than in normal times.

CURRENT INFORMATION ON FLAX.

Hungary: In order to prevent a decrease in the production of textile crops, the Hungarian Government obliges farmers, who in 1940-41 had grown linseed and hemp for flax, to seed to the same crops in 1941-42, an area at last equal to that of the year before.

Owing to legislative measures taken in favour of the increase of oleagineous crops, it may be expected that there will be a heavy increase of area sown to linseed (see Sunflower).

Serbia: It is foreseen that there will be a considerable increase of area sown to linseed for flax. According to very recent, though unofficial information, the area sown to linseed this year should amount to 12,400 acres, *i. e.*, one third of the total area sown to this crop in former Yugoslavia.

CURRENT INFORMATION ON COTTON.

Bulgaria: According to unofficial information, the 1941 cotton crop was rather poor on account of unfavourable weather conditions, and especially of excessive cold in Autumn which hindered and retarded the growth and ripening of the plants.

Egypt: Cotton sowing is in full swing now both in the Delta and the Nile valley. As a consequence of the limitations enacted by the Egyptian government on the area under cotton this year (see *Monthly Crop Report*, October, 1941) it is anticipated that total cotton acreage will be from about 1,360,000 to 1,435,000 acres, compared with 1,706,200 acres in 1941, 1,749,000 in 1940 and 1,821,100 on the average of the 5-year period 1935 to 1939. The official estimate of the 1942 cotton acreage will be issued on July 15. However, if we consider as probable minimum area the figure of 1,360,000 acres, and we reduce the yield per acre from an average of 500 lb. in the period 1935 to 1939 to 450 lb. of cotton lint per acre, owing to the diminished consumption of artificial fertilizers, we may forecast a cotton production for 1942 of about 1,280,000 bales of 478 lb. net weight, a decrease of about 33 per cent. from the average of 1935 to 1939 (1,896,000 bales) and one of about 24 per cent. from the production of 1941 (1,672,000 bales).

CURRENT INFORMATION ON HEMP.

Hungary: See flax.

Serbia: According to unofficial information, the area sown to hemp for fiber this year should amount to 37.000 acres.

CURRENT INFORMATION ON TOBACCO.

Bulgaria: According to press information based on data furnished by the Ministry of Agriculture, the area destined to the tobacco crop in Bulgaria in 1942 (including the territory recently annexed) is estimated at about 213,300 acres. Of this total, 120,000 acres are within the ancient frontiers of the country. In 1941 the area sown to this crop was 111,000 acres. The average for the five years 1936-1940 was about 103,000 acres: percentages, 107.7 and 116.4. What remains, *i. e.*, 93,300 acres, will be sown to tobacco in the zones newly incorporated (Macedonia and Thrace). For comparison sake, it may be mentioned that during the year 1941, in the same zones, about 83,800 acres were sown to tobacco.

The 1941 tobacco production was only 5 per cent. lower than that of the year before. Its quality however was better.

Norway: According to official estimates, areas sown to tobacco in 1941 were about 154,000 square feet. This figure however includes only areas above 54 square feet. As on account of a reduction of importations, in 1941 small areas were sown to tobacco for home consumption, it is estimated that the total area sown to tobacco was considerably bigger.

CURRENT INFORMATION ON OTHER PRODUCTS.

Colza and Sesame.

Bulgaria: The average production of sesame in Bulgaria (within the old frontiers) which during the years 1930/1934 amounted to 66,000 centals (3,300 short tons), fell to 33,000 centals (1,650 short tons) in the following years and to only 4,400 centals (220 short tons) in 1938. This great decrease was due chiefly to the fact that farmers, owing to the ever increasing competition of sunflower and soya crops, had progressively abandoned the cultivation of sesame. The recent crisis in the production of fats has induced farmers to resume the cultivation of this crop. Including the districts that were recently annexed by Bulgaria, it is foreseen that the production of sesame this year may amount to over 110,000 centals (5,500 short tons). Till now the yearly average production of 55,000 centals (2,750 short tons) was more than sufficient to fill the sesame needs of the country, so that in the future surpluses may be available for export.

Sunflowers

Bulgaria: According to unofficial information, weather conditions in 1941 were generally favourable to the sunflower crop. The production of sunflower in 1941 may be considered normal, though it was 30 per cent. higher than in 1940. It is believed that this production will be enough to fill the need of the country for seeds and oil.

Hungary: In order to increase oleagineous crops, the Hungarian Government has obliged farmers that plow an area below 71 acres, to border their maize fields with sunflower. Farmers that in 1940/41 had bordered their maize fields with hemp or sorghum are authorised to do the same in 1941/42 (see also Linseed for seed). All farmers that plow more than 71 acres, are obliged to cultivate sunflower or linseed for seeds as their chief crop on 5 per cent. of their arable land. The proportion of 5 per cent. is reduced to 2 per cent. for farmers that plow more than 710 acres in the case they are obliged to cultivate to oil crops 2 per cent. of their arable land. All these regulations aiming at an increase of oleagineous crops, are accompanied by economic measures in favour of farmers. Among such measures may be mentioned the reduction of the purchase price of seeds, loans with no interests to pay, the right to buy oil-cakes at favourable conditions, etc. It may be expected that these measures, in the year 1942, will cause a big increase of areas sown to oleagineous crops all over Hungary.

Serbia: It is expected that the area sown to sunflower will be considerably increased. According to unofficial information, it should amount, this year, to 74,000 acres, i. e., to nearly the total area sown to that crop in the whole of former Yugoslavia.

Soya.

Serbia: It is expected that the area sown to soya this year will be much larger than last year. According to very recent, though unofficial information, the area sown to soya should amount to 15,000 acres, i. e., nearly double the acreage sown to that crop in the whole of former Yugoslavia.

CURRENT INFORMATION ON FODDER CROPS.

Bulgaria: The Council of Ministers has decreed that the regions situated between the Maritza and Struma rivers as well as those between the Aegean litoral and the old Greco-Bulgarian frontier must be reserved as winter pastures for livestock belonging to the populations of the Rila, Rodopes and Pirin mountains.

Hungary: A census of pastures was taken at the same time with the census of livestock and agricultural machinery. Census operations were carried on between May 4-18 and dealt with the condition of pastures during the year 1941.

The questions contained in the census form bore upon the area of pastures according to their nature (mountain, hill or lowlands, etc.), the kind of animals that fed on them, and the work done to improve them.

Argentina: Owing to drought, the condition of pastures which in the month of January was good, became rather bad in February.

LIVESTOCK AND DERIVATIVES

PIGS IN DENMARK *).

(Thousands)

Classification	1942	1941								
	Feb. 7	Dec. 27	Nov. 15	Oct. 4	Aug. 23	July 12	May 30	April 19	March 8	Jan. 25
Boars for breeding.	8	9	9	10	11	11	11	11	11	11
Sows in farrow for first time . . .	20	23	28	44	57	78	74	64	45	32
Other sows in farrow	67	69	68	79	86	85	87	87	93	100
Sows in milk . . .	34	42	50	59	61	53	47	51	45	44
Sows not yet covered (and not for slaughter) .	20	22	27	24	22	17	18	15	17	20
Sows for slaughter.	11	16	21	18	10	7	8	7	11	14
Total sows	*152*	*172*	*194*	*224*	*236*	*240*	*234*	*224*	*211*	*210*
Sucking pigs not weaned	246	326	398	494	515	440	390	429	364	350
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg. . .	409	513	534	524	462	420	432	409	455	523
Pigs of 35 and under 60 kg. .	387	424	416	401	399	405	366	419	473	503
Fat pigs of 60 kg. and over .	266	247	374	360	317	254	288	333	359	371
Total pigs . . .	*1,468*	*1,691*	*1.925*	*2,013*	*1,940*	*1.770*	*1,721*	*1,825*	*1,873*	*1,968*

*) Rural districts only.

ANIMALS SLAUGHTERED IN EXPORT SLAUGHTERHOUSES IN DENMARK.

Classification	1941	1940	1939	1938	1937	1936	1935
	(Number)						
Cattle	290,152	301,691	331,569	299,814	314,790	250,033	254,845
Young calves.	284,753	308,106	278,222	292,416	347,876	356,729	320,219
Fat calves	233,144	249,358	252,307	243,340	219,123	202,931	203,346
Pigs	2,203,400	3,405,358	4,072,927	3,915,146	4,322,198	4,307,787	4,331,052
Sheep and goats	46,230	46,578	75,135	85,925	88,262	76,881	74,559
Horses.	11,370	12,465	13,664	12,577	12,263	10,518	9,262

PIGS IN SWITZERLAND.

From a survey made by the Federal Bureau of Statistics, it appears that, at the month of November, the quantity of hogs was as follows:

	1941	1940	1939	1937
Young pigs, up to 2 months old . .	149,000	212,100	259,000	248,600
Young pigs, from 2 to 6 months old .	324,600	413,000	458,000	413,000
Pigs for fattening, over 6 months .	310,000	307,000	316,450	300,300
Sows	54,000	65,250	83,200	72,100
Boars	2,400	2,650	3,350	3,000
Total . . .	840,000	1,000,000	1,120,000	1,037,000

Growing difficulties in the importation of forages for livestock make the assessment of home production an absolute necessity. But a correct assessment cannot be properly made unless extremely careful surveys show what the number of animals really is. Especially in these times of war, the number of animals for breeding is subject to various influences. Great changes are registered within comparatively short periods. These changes show a tendency to spread, thus exercising a considerable influence on the future stock. As an addition to the general livestock census of 21 April 1941, (see *Monthly Crop Rep. and Agricultural Statistics*, August 1941, p. 400) a representative survey of the number of pigs was made in about four hundred communes specially chosen among 21 Cantons. Observations made in the course of these surveys make it possible to draw sufficiently safe conclusions on the evolution of animal production at large. In order to fully appreciate their results and make it easier to compare them with those of April 1941, it must not be forgotten that the number of hogs is always higher at the beginning of winter than in the spring. In fact, farmers, for their domestic needs, buy young pigs only after the spring survey. The difference in the number of hogs between spring and autumn is normally of from 100 to 150 thousand heads. As a peculiarity of the development of the number of hogs in 1941, one may mention that the decrease of pigs for breeding was less noticeable than in 1940, while it continued to be evident in the case of young pigs for fattening. This evolution naturally favours fluctuations in the demand and requires very strict measures for the regulation of supplies and the uniform provisioning of the market. Owing to the big decrease in the number of young pigs in 1942, the provisioning of the market will be more difficult than before. After slaughtering fattenend pigs, it would be desirable that no further reduction be brought in the number of these animals. But this will be possible only if births are better distributed in the course of the year

by having young sows covered at the proper time. Lastly, a system might be devised whereby forages may be distributed among breeders on condition that they engage themselves to raise and deliver young pigs at fixed prices. By this system, if practicable, price fluctuations would be reduced. It must be mentioned also that there are still a number of regions where farmers can produce more forages to be used both for hogs raising and fattening.

THE STATISTICS OF SLAUGHTERED ANIMALS IN SWITZERLAND.

The statistics of slaughter animals which the federal Bureau of industry, art and trades and labour gathers regularly in 42 Swiss cities, gave the following results: as regard the towns where the statistics were gathered from 1940 to 1941, the number of animals sent to the slaughter houses decreased 18.2 per cent; the weight of the same animals also decreased 16.8 per cent.

Years	Numbers of slaughterings		Net weight of slaughterings	
	Carcasses	Index No. 1927/31 = 100	Million lb.	Index No. 1927/31 = 100
1941	564,298	84	132,486	88
1940	689,573	102	159,207	105
1939	692,967	103	159,610	106
1938	697,006	104	158,945	105
1937	682,714	102	151,751	101
1936	680,500	101	154,867	103
1935	748,142	111	170,215	113
1934	730,296	109	169,078	112
1933	719,382	107	165,866	110
1932	716,837	107	155,520	103
Average 1927 to 1931	*672,435*	*100*	*150,872*	*100*

The reduction of weight of slaughtered animals was especially marked in the four large cities of over one hundred thousand inhabitants; in the towns from ten to one hundred thousand inhabitants, the decrease was 14.9 per cent., and in villages below ten thousand inhabitants, 15.6 per cent.

By looking over the quarterly figures of the year, it will be found that there was a decrease of 4.3 per cent. between the first quarter of 1941 and the corresponding period in 1940. On the other hand, in the second quarter of 1941 when the slaughtering of pigs was regulated and meatless days were ordered, the decrease was 20.3 per cent. In the third and fourth quarter, as compared with the corresponding periods in 1940, the decrease was 19.7 and 22.2 per cent. respectively.

The following table gives a comparison of the different categories of livestock in 1940 and 1941:

CATEGORIES OF ANIMALS	Number of slaughterings				Net weight in thousand lb.			
	January-December		Difference		January-December		Difference	
	1941	1940	absolute	%	1941	1940	absolute	%
Bulls	13,901	14,360	— 459	— 3.2	10,235.9	11,555.3	— 1,319.4	— 11.4
Oxen	3,884	4,448	— 564	— 12.7	3,074.1	3,432.2	— 358.1	— 10.4
Cows	56,879	54,951	+ 1,928	+ 3.5	32.854.1	33,436.5	— 582.4	— 1.7
Heifers	33,291	29,914	+ 3,337	+ 11.3	18,348.7	17,608.4	+ 740.3	+ 4.2
Calves	233,552	223,847	+ 9,705	+ 4.3	24,714.8	26,155.5	— 1,440,7	— 5.5
Sheep	31,048	40,482	— 9,434	— 23.3	1,369.1	1,784.9	— 415.8	— 23.3
Goats	752	738	+ 14	+ 1.9	24.9	24.3	+ 0.6	+ 2.7
Pigs	188,265	317,261	— 128,996	— 40.7	40,260.3	62,949.9	— 22,689.6	— 36.0
Horses	2,726	3,572	— 846	— 23.7	1,604.5	2,260.2	— 655.7	— 29.0
TOTAL	**564,298**	**689,573**	**— 125,275**	**— 18.2**	**132,486.4**	**159,207.2**	**— 26,720.8**	**— 16.8**

This strong fall in the number of slaughterings was due above all to the decrease in the slaughtering of pigs, which amounted to 40.7 per cent. as regards the number of head, and 36.0 per cent. as regards their weight, always as compared with 1940. (The average weight of pigs had increased from 198 to 214 lb.). The decrease in the number of slaughtered bulls and oxen was considerably less important. As regards cows and veals, it may be noticed that there was an increase in the number of slaughterings and a slight decrease in net weight. There was a small increase both as regards the number of slaughtered heifers and their weight.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Bulgaria: A decree of the Council of Ministers charges the "Direction for the purchase and exportation of cereals" with the monopoly for the purchase and sale of the skins of cattle produced in the country. The same decree deals also with the methods of purchase, sale, control and price fixing of the same product.

According to unofficial information, the production of "*Kachkaval*" cheese in 1941 was about 10 per cent. below that of 1940 and 30 per cent. below that of 1939. The production of butter in 1941 was also below that of 1940. This decrease in the production of milk products must be attributed above all to the poor feeding of cattle owing to lack of forages and their very high price.

Hungary: About the end of February, the sanitary condition of livestock was generally satisfactory. The Hungarian Central Bureau of Statistics, between the 4th and 18th of March, took a census of livestock in order to find out what was the number of head at February 28 this year.

Switzerland: Information furnished by 814 milk companies, show that milk delivered in the month of January was 8.7 per cent. less than in the same month last year. It must be mentioned, however, that in January 1941, milk deliveries had been 5 per cent. higher than in the same month in 1940. It may be said, therefore, that both production and deliveries were good.

Argentina: In the month of February, the sanitary condition of cattle was not as good as in the month before.

TRADE

Romania: Exports.

Products and Units	December 1941	December 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940-41
Wheat . . . 1,000 centals	37	0	92	15	18
Thous. bush. of 60 lb.	62	0	154	25	30
Barley . . . 1,000 centals	0	105	44	959	1,138
Thous. bush. of 48 lb.	0	218	92	1,998	2,370
Oats . . . 1,000 centals	0	17	0	174	200
Thous. bush. of 32 lb.	0	52	0	544	626
Maize . . . 1,000 centals.	17	392	19	533	3,305
Thous. bush. of 56 lb.	30	701	34	952	5,902

Sweden: Imports.

Products and Units	January 1942	January 1941	Total from the beginning of the season *) 1941-42	Total from the beginning of the season *) 1940-41	Total of the season *) 1940-41
Wheat . . . 1,000 centals	0	0	1	277	277
Thous. bush. of 60 lb.	0	0	1	461	461
Rye . . . 1,000 centals	0	8	0	835	835
Thous. bush. of 56 lb.	0	14	0	1,491	1,491
Maize . . . 1,000 centals	0	15	52	170	695
Thous. bush. of 32 lb.	0	45	163	533	2,172

*) Season beginning August 1st for wheat, rye, barley and oats; November 1st for maize.

STOCKS

Stocks of cereals in farmers' hands in the United States on January 1st.

Products	1942	1941	1940	1939	1942	1941	1940	1939	1942	1941	1940	1939
	Percentage of total production				Thousand centals				Thousand bushels			
Wheat . . .	39.5	34.8	31.2	30.1	224,280	170,329	140,708	168,053	373,800	283,882	234,514	280,088
Oats . . .	65.8	64.1	63.5	65.1	239,808	253,446	190,037	222,622	749,400	792,019	593,865	695,695
Maize [1]) . . .	75.2	83.2	81.7	78.9	1,126,776	1,013.722	1,071,943	1,019,938	2,212,100	1,810,218	1,914,184	1,819,710

[1]) Data based on maize for grain.

Cotton stocks on hand in the United States.

Location	Dec. 1941	Nov. 1941	Oct. 1941	Dec. 1940	Dec. 1939	Dec. 1941	Nov. 1941	Oct. 1941	Dec. 1940	Dec. 1939
	Last day of month									
	Thousand centals					Thousand running bales (counting round as half bales)				
In consuming establishments . . .	11,778	...	9,798	9,015	9,144	2,394	...	1,994	1,834	1,860
In public storage and at compresses . . .	67,473	...	65,632	74,027	71,740	13,714	...	13,342	15,047	14,582
Total . . .	*79,251*	...	*75,430*	*83,042*	*80,884*	*16,108*	...	*15,336*	*16,881*	*16,442*

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	March 13, 1942	March 6, 1942	Feb. 27, 1942	Feb. 20, 1942	Monthly averages: Feb. 1942	March 1941	March 1940	March 1939	March 1938
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery May	79 1/4	79 1/4	77 1/8	79 3/8	79 1/8	77 1/2	88 7/8	60 7/8	120 1/8
„ July	80 1/4	80 3/8	78 1/4	80 1/2	80 1/4	79 1/8	90	61 5/8	111 1/4
„ October	—	—	—	—	—	—	91 3/8	62 1/2	92 7/8
Chicago (cents. p. 60 lb):									
delivery May	130 1/4	129 3/8	129 1/4	130 1/8	129 1/4	86 5/8	102 7/8	68 1/8	88 1/4
„ July	131 7/8	131	130 7/8	131 3/4	130 7/8	83 3/4	101	68 1/4	84 3/8
„ September	133 3/8	132 3/4	132 5/8	132 5/8	132 5/8	84 1/8	100 1/2	69	84 7/8
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery May	66 5/8	66 5/8	66 1/4	66 5/8	66 1/2	53 1/4	72 1/2	40 5/8	75
„ July	66 5/8	66 5/8	66 1/4	66 5/8	66 1/2	53 5/8	72 3/4	41 1/4	74 3/8
„ October	66 5/8	66 5/8	66 1/4	66 5/8	66 1/2	—	72 1/2	41 1/2	—
Chicago (cents p. 56 lb.):									
delivery May	84 1/4	85 3/4	85 3/4	86 7/8	86 1/4	44	66 1/2	43 1/8	68 5/8
„ July	87 1/4	88 1/4	88 1/4	89 1/2	88 5/8	50 1/4	67 3/8	44 1/8	65 1/2
„ September	89 1/2	90 1/4	90 1/4	91 3/8	90 1/2	50 3/4	68 3/8	45 1/4	64 5/8
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery May	64 3/4	64 1/8	63 1/2	64 3/8	64	49 7/8	53 1/2	37	61 3/8
„ July	63 3/4	62 7/8	61 5/8	62 5/8	62 1/2	46 1/4	51 5/8	35 3/8	58 3/8
„ October	62 5/8	60 1/8	58 1/2	60 1/8	60 1/8	* 43 5/8	49 3/4	* 34 3/4	* 53 1/8
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery May	51 1/8	50 7/8	49 1/4	49 7/8	49 5/8	35 1/2	40	28 7/8	46 5/8
„ July	50 1/2	49 7/8	47 7/8	48 5/8	* 48 1/2	33 7/8	38 5/8	28 3/8	43 1/4
„ October	49 3/4	49	46 1/4	47 3/8	47 1/4	32 1/4	35 1/4	28 1/4	38 5/8
Chicago (cents p. 32 lb.):									
delivery May	56 1/4	56 1/4	57 1/4	57 7/8	57 1/8	36 1/4	41 1/8	29 1/8	30 1/8
„ July	55 3/4	55 3/4	56 3/8	57 1/4	56 5/8	33	36 1/8	27 3/8	28 3/4
„ September	56 1/4	55 7/8	56 3/8	57 1/8	56 5/8	32	33 1/2	26 3/4	28 7/8
Maize.									
Chicago (cents p. 56 lb.):									
delivery May	88 1/2	88	86 5/8	88	86 7/8	63 5/8	56 5/8	48 1/4	59 5/8
„ July	91	90 1/4	88 3/4	90	88 7/8	63 3/4	57	49 3/4	61 1/4
„ September	92 1/4	91 3/4	90 1/4	91 5/8	90 3/8	63 5/8	57 3/4	50 3/4	62 3/8
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery May	164	164	164	164	163 1/2	175 7/8	205 3/8	157 1/4	166 1/8
„ July	164	164	164	164	163 5/8	173 1/2	204 3/4	154	167 1/8
„ October	164	164	164	164	163 7/8	163 7/8	197 3/4	—	—

* Indicates that the product was not quoted during part of the period under review.

THE NEW INDEX-NUMBERS OF PRICES IN SWEDEN

The Swedish Agricultural Association (Sveriges Lantbruksförbund) has recently published a new series of index-numbers of prices of agricultural products and of means of production purchased and other expenses which weigh directly on agricultural holdings.

As these index-numbers are to refer to prices and not to values, the weights to be established for the different products is to be the same both for the base years and for more recent periods. The actual importance of various earnings and expenses could only be used for weighing on condition that the base period chosen be as near as possible. This has been done through the adoption of the years 1935 to 1937, but changes brought about, by war in Europe, in the use of certain means of production, as well as by the bad harvest of 1940, caused such heavy disorders in the proportions that, beginning from September 1940, no general index-number and only one group index-number has been calculated. Therefore the data published give in most cases only indications by product. Certain entries, for instance those dealing with horticulture practiced by farmers or with the use of draft animals for non-agricultural activities, are not included in the calculations. As regards data of prices included in the series, they refer to those which were paid farmers for their products or, respectively, to those paid by farmers for means of production used by them.

In the group index-numbers appear certain kinds of income (contributions to producers, among others) which are not taken into account in the data for separate products, consequently the group index-numbers may by higher than each of the figures taken one by one.

As regards the different headings, the following remarks have to be made:

"*Machinery and implements*" include the new "normal" purchases and the upkeep of machinery.

"*Costs in relation with tractors*" include the new normal purchases of tractors, their upkeep, expenses for their use and lubricants.

"*Sundry costs*": the main items are expenses for transportation and electric power. This group includes also a certain number of small objects of current use, as horse shoes, salt for hay, disinfectants, peat-litter, etc.

"*Soil improvements*" include amortisation and upkeep of drainage plants, etc.

"*Agricultural wages*": salaries paid in cash or in kind to agriculturists and agricultural labourers. Among salaries in kind housing and fuel are included.

INDEX-NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS AND OF COMMODITIES BOUGHT BY THE FARMER

Description	Dec. 1941	Nov. 1941	Oct. 1941	Sept. 1941	Aug. 1941	July 1941	Dec. 1940	Dec. 1939	Year 1940-41 (3)	Year 1939-40 (3)
Germany										
(Statistisches Reichsamt; products sold by farmers) Average for corresponding months 1909-10/1913-14 = 100.										
Cereals	114	113	112	111	113	102	113	113	111	111
Edible potatoes	116	108	108	134	171	173	111	111	118	115
Plant products	114	112	110	115	127	131	113	113	113	112
Meat animals	105	100	98	99	101	106	97	97	99	98
Livestock products (butter and eggs)	121	119	118	123	128	137	121	109	126	118
Livestock and livestock products	110	105	104	106	109	116	104	100	107	104
Total agricultural products	111	108	106	109	114	119	107	104	109	106
Germany										
(Statistisches Reichsamt; wholesale products) 1913 = 100.									1941	1940
Agricultural products	113.1	111.8	111.4	112.8	114.4	113.5	110.5	107.6	112.4	110.7
Fertilizers	...	...	53.2	52.6	52.0	51.0	53.5	53.5	53.6	53.1
Consumption goods (1)	146.9	147.0	146.8	146.5	146.6	146.5	145.0	137.0	146.9	141.6
Wholesale products in general	113.1	112.4	112.2	112.5	112.8	112.4	110.9	107.6	112.2	110.0
Argentina										
(Banco Central de la República Argentina) 1926 = 100.										
Cereals and linseed	60.2	61.3	61.6	60.7	60.4	60.5	59.7	85.0	60.3	68.8
Meat	102.4	101.0	104.2	108.2	109.1	106.9	94.2	103.1	102.4	102.9
Hides and skins	126.4	117.4	107.0	100.8	93.3	97.0	103.1	112.3	103.4	92.1
Wool	120.2	125.7	123.8	113.1	110.2	110.5	94.1	131.8	110.5	116.6
Dairy products	98.2	119.4	111.6	122.6	155.5	111.1	77.0	82.0	98.4	82.0
Forest products	121.5	121.5	121.6	121.5	121.5	121.5	111.2	116.6	120.2	112.8
Total agricultural products	78.6	79.4	78.8	77.6	76.4	76.4	72.6	93.8	75.9	80.4
Non-agricultural commodities	194.3	189.5	185.9	181.2	174.0	163.6	138.0	129.1	163.4	135.4
Wholesale products in general	169.4	165.9	162.9	159.0	153.1	144.9	123.2	121.7	144.7	123.4
Denmark										
(Det landökonomiske Driftsbureau) Average 1909 to 1914 = 100										
Cereals	216	216	216	216	207	207	207	150	210	179
Total plant products (2)	252	254	256	255	246	246	239	153	248	210
Dairy products	216	216	216	216	216	221	195	133	216	156
Total animal products (2)	226	225	222	222	225	222	203	147	219	161
Total agricultural products	228	227	225	224	226	224	205	147	221	165
Fertilizers	171	170	170	169	170	169	168	107	170	134
Concentrated feedingstuffs	—	—	—	—	—	—	210	173	—	187
Seeds	238	238	238	238	238	238	141	96	235	141
Total products purchased	—	—	—	—	—	—	194	152	—	171

(1) Household goods of all kinds, and clothing. (2) — Including non-specified products. — (3) Agricultural year: July 1-June 30.

Description	Dec. 1941	Nov. 1941	Oct. 1941	Sept. 1941	Aug. 1941	July 1941	Dec. 1940	Dec. 1939	Year 1941	Year 1940
Hungary										
(Central Royal Bureau of Statistics) 1929 = 100.										
Cereals	132.1	132.1	132.1	132.1	132.1	130.5	103.9	87.7	118.5	96.2
Total raw plant products (1)	131.8	129.7	128.8	132.6	131.9	129.0	113.5	82.5	122.7	101.9
at animals, meat and lard	132.7	132.5	133.8	134.2	132.9	129.7	100.7	65.7	122.9	87.1
Total livestock products (1)	124.3	123.9	124.7	125.3	123.1	120.8	96.2	67.7	114.2	85.1
Total agricultural products	129.4	127.8	127.5	130.3	129.2	126.4	108.1	77.8	120.0	96.7
Products of agricultural industries	150.8	141.0	141.0	141.0	140.5	138.2	107.2	95.7	125.0	101.0
Industrial raw materials and products.	139.6	137.3	134.6	132.3	126.8	120.4	108.7	96.0	123.3	102.3
Wholesale products in general.	137.4	134.5	133.1	133.0	129.8	125.3	108.7	89.2	122.7	100.3
Norway									1940-41 (2)	1939-40 (2)
(Landbrukshöiskole) Average 1909 to 1914 = 100										
Plant products	254	254	246	263	...	226	216	178	229	168
Pork	231	231	231	231	...	231	183	158	172	144
Other meat	270	270	270	270	...	270	233	180	226	172
Dairy products	242	245	247	247	...	252	239	178	215	173
Eggs	221	221	221	221	...	206	185	126	161	122
Livestock products	243	245	246	246	...	249	226	173	206	165
Total agricultural products	246	247	246	250	...	244	224	174	211	166
Superphosphate, 16 %	189	189	184	184	...	184	203	184	192	141
Potash salt, 40 %	115	115	118	118	...	118	131	110	117	109
Nitrate of lime, 15 1/2 %	79	79	83	83	...	83	85	77	82	78
Feedingstuffs for milk production	247	246	246	246	...	246	246	178	227	167
Feedingstuffs for pork production	—	—	—	—	...	—	—	165	—	157
Building materials	238	236	236	236	...	233	220	191	210	183
Machinery and implements	302	302	302	302	...	302	261	232	250	219
Total production goods bought	...	...	...	...	...	...	228	183	214	174
Consumption goods bought	285	...	283	...	275	273	250	193	232	184
Total goods for production and consumption bought	...	...	...	...	...	...	238	187	222	178
Agricultural wages.	...	...	...	...	...	...	238	215	238	215
Norway										
(Kgl. Selskap for Norges Vel) Average 1909-1914 = 100.										
Cereals	257	257	257	257	213	213	213	170	195	168
Potatoes	259	259	263	299	319	250	230	206	282	186
Pork	248	248	248	248	248	248	195	159	177	141
Other meat	265	265	265	265	265	265	228	173	217	168
Dairy products	219	219	219	219	219	219	219	193	208	186
Eggs	233	233	233	233	228	217	195	132	169	129
Concentrated feedingstuffs	201	201	214	214	214	214	214	170	285	163
Maize	—	—	—	—	—	—	—	172	194	165
Fertilizers	99	102	123	123	123	123	132	112	127	101

(1) Including unspecified products. — (2) Agricultural year: April 1 to March 31.

Description	Dec. 1941	Nov. 1941	Oct. 1941	Sept. 1941	Aug. 1941	July 1941	Dec. 1940	Dec. 1939	Year 1940-41 (1)	Year 1939-40 (1)
Netherlands										
(Bureau of Agriculture) Average 1924-25 to 1928-29 = 100.										
Plant products	87	89	89	90	89	87	78	70	79	69
Livestock products	96	93	95	99	103	106	84	69	89	71
Total agricultural products	94	92	93	97	100	102	83	69	87	70
Agricultural wages	...	...	...	...	...	...	86	75	86	77
Sweden										
(Sveriges Lantbruksförbund Average 1935-1937 = 100									1941	1940
Bread cereals	171.4	171.4	171.4	171.4	155.5	—	...	...	161.9	134.2
Barley	171.6	174.9	174.9	174.9	174.9	—	165.2	115.9	169.7	141.1
Oats	169.6	173.3	173.3	173.3	173.3	—	172.9	120.2	172.7	152.2
Dry peas	220.8	220.8	220.8	220.8	220.8	—	216.9	176.7	226.0	191.1
Edible potatoes	155.5	150.2	151.1	153.7	320.8	301.5	126.5	111.8	167.8	172.0
Potatoes for industrial purposes	174.8	171.3	167.5	167.5	167.5	167.5	160.2	134.7	167.5	140.1
Sugarbeets	174.3	174.3	174.3	174.3	—	—	128.1	114.6	151.2	121.4
Hay	271.9	271.9	271.9	271.9	271.9	271.9	396.4	111.6	315.6	220.1
Milk for liquid consumption, to be sold.	(2) 170.5	(2) 159.1	(2) 159.1	158.0	156.7	156.6	162.1	121.8	(2) 159.4	137.2
Milk for liquid consumption on the farm	174.5	162.8	162.7	158.1	157.9	158.3	159.5	127.4	160.6	136.5
Butter	168.8	168.5	168.3	162.8	162.5	163.0	164.4	132.9	164.6	139.5
Cheese	—	—	—	—	—	—	157.9	133.3	—	136.8
Total dairy products	(2) 189.0	(2) 181.6	(2) 182.6	174.1	173.7	174.3	...	133.7	(2) 176.0	145.7
Eggs	202.7	205.0	174.7	182.3	174.7	170.0	148.3	127.5	173.3	127.8
Full-grown cattle	194.8	193.7	193.7	193.7	192.7	191.6	141.4	121.5	183.9	132.7
Big calves	191.3	192.6	191.3	189.2	178.4	173.6	176.3	131.4	181.0	138.3
Small calves	174.4	161.9	161.9	160.8	147.2	145.0	166.5	134.8	161.8	123.8
Sheep	178.3	172.3	173.0	173.6	180.3	193.8	166.9	124.5	189.4	151.3
Pigs	174.0	173.1	172.2	172.2	172.2	170.5	156.0	120.0	167.3	135.0
Chemical fertilizers and chalk	136.5	136.1	136.1	136.1	136.1	136.0	131.4	106.7	135.8	125.1
Feedingstuffs bought	141.2	141.2	141.2	141.2	124.9	124.9	124.9	127.3	130.4	125.7
Machinery and implements	144.5	144.5	144.5	144.5	144.3	144.3	132.7	121.8	144.0	126.7
Costs in relation with tractors	314.2	313.7	313.7	313.7	313.7	313.7	199.5	132.1	293.7	168.4
Cost of maintenance and amortisation of agricultural buildings	(2) 150.1	149.3	148.6	148.6	148.5	148.1	137.4	123.9	(2) 145.7	134.6
Sundry costs	(2) 183.5	(2) 184.0	(2) 183.6	181.4	179.6	178.3	157.4	121.5	(2) 176.5	141.6
Cost of soil improvement	153.4	153.4	153.4	153.4	153.4	153.4	141.7	126.4	148.3	135.7
Agricultural wages	158.2	155.3	155.0	154.2	158.1	157.4	146.7	123.3	151.5	138.2
Interest of capital	(2) 94.8	(2) 94.8	(2) 94.8	95.1	95.1	95.1	99.8	93.6	(2) 96.9	98.4
Switzerland										
(Schweizerischer Bauernverband) 1914 = 100.										
Slaughter cattle	179	179	175	172	167	164	132	132	159	128
Slaughter pigs	226	226	224	223	221	221	181	141	212	154
Milk (base price)	159	159	147	147	147	147	147	123	149	135
Total agricultural products	183	182	177	174	174	172	155	132	...	144
Feedingstuffs (3)	200	199	199	202	203	203	179	127	194	146
Fertilizers (3)	128	128	128	129	129	129	124	104	127	113
Wholesale products in general (3)	198.7	197.6	192.8	191.0	189.4	187.5	163.9	125.1	183.5	143.0

(1) Agricultural year: July 1 to June 30. — (2) Provisional figure. — (3) Index numbers calculated by the Bundesamt für Industrie, Gewerbe und Arbeit; base July 1914.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT
AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country : Germany, Bohemia and Moravia (Protectorate); Hungary : 1 = excellent, 2 = good, 3 = average, 4 = poor, 5 = very poor; Finland : 8 = very good, 6 = above the average, 5 = average; France : 100 = excellent, 70 = good, 60 = fairly good, 50 = average, 30 = poor; Romania and Sweden : 5 = excellent, 4 = good, 3 = average, 2 = poor, 1 = very poor; Netherlands : 90 = excellent, 70 = good, 60 = fairly good, 50 = below awerage; Portugal : 100 = excellent, 80 = good, 60 = average, 40 = poor, 20 = very poor; Switzerland : 100 = excellent, 90 = very good, 75 = good, 60 = fairly good, 50 = average, 40 = rather poor, 30 = poor, 10 = very poor; U. S. S. R. : 5 = good, 4 = above the average, 3 = average, 2 = below average, 1 = poor; Canada : 100 = crop condition promising a yield equivalent to the average yield of a long series of years; United States : 100 = crop condition which promises a normal yield; Egypt : 100 = crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed : 100 = crop condition which promises a yield equal to the average of the last ten years.

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

VEGETAL PRODUCTION

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE, BARLEY AND OATS.

Belgium: The Ministry of Agriculture and Foodstuff communicates that for the next sugar season the area to sugar beets is likely to be larger than that of 1941, but that it is impossible to determine the extent of this increase.

Bulgaria: Towards the end of February the Council of Ministers issued a decree whereby all the regions of Aegean Thrace, right after the harvest of the wheat and rye crops, must immediately proceed to re-seeding these areas to another Spring crop, such as tobacco or maize, according to the nature of the land and climate. Local authorities are required to take all necessary measures to guarantee farmers the delivery of seeds, carburants and labour hands.

Spain: In competent agricultural quarters, the opinion prevails that areas sown to wheat for the 1942 crop were 10 per cent. lower than in 1941. The 1941 wheat crop in Spain was very poor, so that the Government has attempted by all means to obtain an increase of area sown to wheat and consequently an increase of wheat production. The idea was to attain the same amount of area sown to wheat in the year before the civil war, i. e., 11,1 million acres: a figure from which the 9,6 million acres sown last year were still very far. The 1941 harvest amounting to 64 million centals (107 million bushels), may be considered exceptionally bad, if one thinks that, before the civil war a good normal crop yielded 90 million centals (151 million

Area and Production of Cereals.

Countries	Area 1941	Area 1940	Area Aver. 1935 to 1939	Area % 1941: 1940 = 100	Area % 1941: Aver. = 100	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production % 1941: 1940 = 100	Production % 1941: Aver. = 100
	000 acres					000 centals			000 bushels				
Wheat													
Belgium	439	(w) 354	394	—	111.4	...	...	9,691	...	...	16,151	...	...
Denmark	203	199	316	101.8	64.1	4,189	4,094	8,617	6,981	6,823	14,361	102.3	48.6
Spain	9,445	8,735	(1)8,639	108.1	109.3	65,377	47,648	63,270	108,959	79,412	(1)105,448	137.2	103.3
Finland	331	349	264	94.8	125.3	3,426	3,939	4,208	5,710	6,565	7,013	87.0	81.4
France	...	...	12,503	...	...	165,347	94,799	171,097	275,573	157,995	285,157	174,4	96.6
Ireland	491	305	225	160.9	218.4	...	7,011	4,613	..	11,685	7,689	...	...
Italy	...	12,566	12,639	...	...	157,683	156,623	167,713	262,799	261,033	279,517	100.7	94.0
Netherlands	339	331	338	102,2	100,2	...	...	9,113	...	...	15,188	...	...
Romania	(2)5,807	(2)5,014	9,054	115,8	—	(2)54,124	(2)30,225	84,491	(2)90,204	(2)50,375	140,816	179.1	—
Slovakia	550	533	(3) 539	103.1	102.1	6.955	6,740	(3) 8,572	11,591	11,233	(3) 14.287	103.2	81.1
Sweden	708	763	741	92.8	95.6	7,255	9,276	15,811	12,091	15,459	26,351	78.2	45.9
Switzerland	215	191	184	112.5	116.9	...	3,631	3,711	...	6,051	6,185	...	...
Canada	22,372	28,726	25,596	77.9	87.4	181,576	330,834	187,440	302,626	551,390	312,399	54.9	96.9
Un. St. (w)	40,316	36,147	41,186	111.5	97.9	567,540	353,491	351,467	945,900	589,151	585,778	115.8	124.1
Un. St. (s)	16,467	17,356	16.387	94.9	100.5		136,528	105,964		227,547	176,606		
Mexico	1,347	1,450	1,251	92.9	107.6	8,257	8,002	7,391	13.828	13,337	12,318	103.7	112.3
India (4)	34,499	34,003	34,485	—	—	224,400	241,562	222,396	374,000	402.603	370,660	92.9	100.9
Japan	1,983	2,024	1,738	96.1	114.1	32,377	39,682	30,078	53.960	66,135	50,130	81.6	107.6
Syria and Leb.	1,600	...	1,363	...	117.4	16,560	14,760	11,692	27,600	24,600	19,486	112.2	141.6
Algeria	...	...	4,176	...	...	19,200	16,560	20,890	32,000	27,600	34,816	115.9	91.9
Egypt	1,561	1,563	1,464	99.9	106.7	24.918	29,997	27,510	41,529	49,994	45,848	83.1	90.6
Tunisia	1,322	1,359	1,884	97.3	70.2	8,819	6,393	9,019	14.697	10,655	15.031	137.9	97.8
Argentina	(5)18,039	(5)17,569	(5)18,664	102.7	96.7	136,687	162,706	131,710	227,807	271,171	219,512	84.0	103.8
Chile	1,660	1,930	1,963	86.0	84.6	...	...	18,937	...	...	31,562	...	...
Uruguay	1,043	924	1,228	112.8	84.9	...	4,235	7,954	...	7,058	13,256	...	...
Australia	12,654	12,454	13,128	101.6	96.4	99,658	49,583	101,821	166,096	82,639	169,702	201.0	97.9
New Zealand	300	240	221	125.0	135.5	6,000	5,040	4,277	10,000	8,400	7,129	119.0	140.3
Rye													
Belgium	310	280	369	110.7	84.1	...	...	7,790	...	...	13,910	...	...
Denmark	474	339	352	139.6	134.7	6,614	5,908	5,552	11,811	10,551	9,915	111.9	119.1
Spain	1,473	1,361	(1)1,302	108.2	113.1	8,754	7,740	(1) 9,041	15,632	13,821	(1)16,144	113.1	96.8
Finland	467	459	578	101.8	80.8	5,137	4,627	7,774	9.173	8,263	13,883	111.0	66.1
Netherlands	596	563	559	105.7	106,6	...	...	11,386	...	...	20,332	...	...
Slovakia	372	368	(3) 380	101.1	97.8	4,409	4,403	(3) 5,259	7,874	7,862	(3) 9,391	100.2	83.8
Sweden	509	422	495	120.5	102.7	6,113	5,862	8,304	10.916	10,468	14,828	104.3	73.6
Switzerland	35	25	38	136.2	90.6	...	498	711	...	890	1,269	...	...
Canada	1,077	1,035	816	104,1	131.9	7,374	7,837	5,147	13,167	13,994	9,191	94.1	143.3
United States	3,436	3,192	3,723	107.6	92.3	26,019	22,737	25,576	46,462	40,601	45,672	114.4	101.7
Argentina	(5)2,661	(5)2,751	(5)2,511	96.8	106,0	3,527	4,678	5,586	6,299	8,354	9,974	75.4	63.2
Chile	19	24	30	81.7	64.4	...	...	173	...	...	309	...	...
Barley													
Belgium	74	57	76	130.4	98.0	...	...	1,757	...	...	3,661	...	...
Denmark	930	956	939	97.2	99.0	20,503	25,104	25,191	42,715	52,301	52,483	81.7	81.4
Spain	3,886	3,859	(1)3,382	100.7	114.9	37,146	30,769	31,262	77,390	64,103	65,130	120,7	118.8
Finland	326	281	305	116.0	106.9	2,910	3,061	4,070	6,063	6,377	8,478	95.1	71.5
Ireland	169	132	118	128.0	143.2	...	3,114	2,598	...	6,487	5,413	...	...
Slovakia	489	497	(3) 492	98.5	99.5	5,842	6,719	(3) 6,946	12,172	13,999	(3) 14,470	86,9	84.1
Sweden	244	264	252	92,6	97,0	3,514	4,173	4,777	7,322	8,694	9,952	84.2	73.6
Switzerland	44	28	12	159.0	351.0	...	511	206	...	1,066	430	...	...
Canada	5,449	4,341	4,291	125.5	127.0	56,457	50,043	42,663	117,619	104,256	88,882	112.8	132 3
United States	13,977	13,394	10,774	104.4	129.7	168,731	148,433	113,409	351,522	309,235	236,270	113.7	148.8
Japan	...	1,848	1.892	...	...	36,385	37,198	35,112	75,803	77,498	73,152	97.8	103.6

Area and Production of Cereals.

Countries	Area 1941	Area 1941	Area Aver. 1935 to 1939	% 1941: 1940 = 100	% 1941: Aver. = 100	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production 1941	Production 1940	Production Aver. 1935 to 1939	= 1941: 1940 = 100	= 1941: Aver. = 100
	000 acres					000 acres			000 bushels				
Algeria . . .	...	...	3,058	...	...	15,360	7,920	15,415	32,000	16,500	32,114	193.9	99.6
Egypt . . .	255	268	278	95.1	95.1	4,699	5,315	7,339	9,789	11,073	15,290	88.4	64.0
Tunisia . . .	...	...	1,174	...	...	4,400	2,000	4,564	9,186	4,134	9,508	222.2	96.6
Argentina . .	(5)1,972	(5)2,139	(5)1,903	92.2	103.6	8,444	17,395	11,329	17,591	36,239	23,602	48.5	74.5
Chile	128	128	184	99.9	69.5	...	...	2,419	...	...	5,041	...	...
Uruguay . .	67	54	(6) 36	122.7	—	...	216	(6) 259	...	450	(6) 539	...	...
New Zealand	30	26	24	115.4	125.5	550	481	461	1,146	1,002	961	114.4	119.2
Oats													
Belgium . .	413	...	548	...	75.4	...	...	14,074	...	...	43,982	...	...
Denmark . .	846	843	926	100.3	91.4	16,314	19,641	22,303	50,982	61,378	69,697	83.1	73.1
Spain . . .	1,646	1,597	(1)1,423	103.1	115.7	12,469	10,459	(1)10,549	38,964	32,685	(1)32,966	119.2	118.2
Finland . . .	1,055	1,054	1,142	100.1	92.4	10,626	11,128	15,974	33,207	34,776	49,917	95.5	66.5
Ireland . . .	779	681	571	114.4	136.5	...	16,222	12,565	...	50,694	39,265	...	...
Slovakia . .	370	365	(3) 333	101.5	131.3	...	4,596	(3) 3,660	...	14,363	(3) 11,437	...	...
Sweden . . .	1,553	1,569	1,641	99.0	94.7	17,139	20,660	27,904	53,459	64,563	87,199	83.0	61.4
Switzerland .	80	53	28	150.2	286.3	...	1,140	510	...	3,562	1,593	...	...
Canada . . .	13,841	12,298	13,246	112.6	104.5	120,138	129,379	114,94	375,430	404,309	359,201	92.9	104.5
United States	37,236	34,847	35,417	106.9	105.1	364,430	395,401	329,369	1,138,843	1,235,628	1,029,279	92.2	110.6
Algeria . . .	...	...	470	...	...	2,560	...	3,387	8,000	...	10,585	...	75.6
Argentina . .	(5)3,519	(5)3,899	(5)3,567	90.2	98.1	10,362	11,894	16,254	32,380	37,168	50,795	87.1	63.7
Chile	168	198	279	85.3	60.3	...	...	2,455	...	...	7,670	...	...
Uruguay . .	237	225	213	105,5	111.2	...	421	992	...	1,316	3,100	...	...
New Zealand	60	61	63	98.4	95.4	1.080	1,120	1,174	3,375	3,500	3,669	96.4	92.0

(*w*) Winter crop. — (*s*) Spring crop. — (1) Year 1939. — (2) Not including territories transferred in 1940. — (3) Average of two years — (4) Final estimate except for 1941 area, the figure of which is that of the fourth estimate. — (5) Area sown. — (6) Not including barley for brewery.

bushels). Instead of the increase hoped for, the contrary has happened and there has been a decrease. The reason given for this fact by competent agricultural people is that there has been a dearth of fertilisers, tractors, and draft animals needed for agricultural works. To this cause must be added the alimentary difficulties of agricultural labourers. As far as has been ascertained, farmers in many regions have planted potatoes instead of sowing wheat, because in recent years potatoes fetched higher prices than wheat. In other regions, a part of areas sown in the preceding years had been turned into pastures. High prices paid today for cattle account for this change. On the whole it is reasonable to believe that, even if the 1942/43 harvest is good (which was not the case these last three years) Spain will not be able to insure the necessary food for its population without imports from Argentina.

Abundant rains during the month of March helped the development of winter cereals in most of the agricultural regions of the country, so that estimates of the winter wheat crop, for instance, are very optimistic nearly everywhere in spite of the reduction of the area sown to that cereal.

According to official estimates, the areas sown to winter cereals up to December 31, 1941, compared with the corresponding figures for 1940 and the 5-year period average 1931-35, are as follows:

Areas sown to winter cereals up to December 31.

(Thousand acres)

	1941	1940	Average 1931-35
Winter wheat	8,723	9,314	11,261
Winter barley	3,796	3,632	4,683
Winter rye.	1,396	1,407	1,466

The areas sown to winter wheat in 1941 are smaller than those of the preceding years in all provinces, except in the maritime districts, more particularly in the Levante region, where in many instances increases are reported. The areas sown to winter barley are larger everywhere, while the rye acreage has remained practically unchanged, even if there is some little decrease. By the end of April conditions were generally good.

Greece: In spite of all the difficulties the country is now going through, the area sown to wheat and other bread-making cereals has been considerably increased. Towards the middle of April the condition of the cereal crops was considered quite favourable.

Hungary: During the four weeks February 28 March 27, the weather was constantly cold. Rains were below average all over the country. Snow melting was generally slow. Towards the end of the period under consideration plowing and sowing had been started on the highest parts of the country and on dry soil. Seedings of winter cereals as a whole went through the winter well. Here and there damages were registered on account of frost and brown rust. Preparatory work for the sowing of spring cereals had been started at different places. About the end of the period under consideration, farmers hoped to be through sowings of Spring cereals within the proper time.

Romania: During the months of February and March, the Ministry of Agriculture took all necessary measures to put the farmers in the condition to begin Spring plowing and sowing without delay. A survey of all the means of production was made, and regions showing a deficit in the stocks for seeding were duly noted down. Within the proper time, the regions showing a surplus stock will send seeds to those which have not enough. Unfortunately, the cold weather in the month of March and during the first ten days in April made it impossible for farmers to begin Spring plowing and sowing on a large scale. According to statements by the Minister of Agriculture, during this Spring the Romanian farmers must seed 1 million hectares (2,470,000 acres) more than usual in order to make up for having been prevented to do so last Autumn on account of bad weather and early winter. A part of this area will be sown to Spring barley, oats and winter wheat, but most of it will probably be destined to maize which is sown later than straw cereals. From what has been said above, it appears that this year the seeding of Spring crops will be done with a considerable delay. On the other hand, the soil is quite wet, and thus germination and growth of the plants will be quickened. Winter wheat crops at the beginning of April appeared in good condition.

Slovakia: This year agricultural works are about four or five weeks later than normally on account of a belated winter. In some regions it has been difficult to get seeds; but the soil will not be left without crops. Wheat and winter rye suffered some damages in some regions, which will be reseeded to Spring cereals.

Sweden: It is known from official sources that, in spite of the exceptional cold of last winter, the condition of winter crops is good thanks to the heavy blanket of snow which covered the fields. Preparatory works for Spring seedings are 4 weeks late, owing to continued cold.

Switzerland: The Fall of 1941 was favourable to sowings and to the development of winter seedings. Germination and vegetation were quite normal. On the other hand, the great cold of the winter and the exceptional continuation of snowfalls did not fail to cause some damage to the fields sown to cereals. Especially rye and winter barley were rather seriously hit. In several cases these crops suffered from the effects of musty snow. Thanks to favourable weather in the last period, however, several crops which had been badly damaged, recovered pretty well. Here and there, some fields had to be seeded again. On the whole, wheat and spelt went through the winter satisfactorily. It is easy to remedy to thin seedings by an application of a fertilising cover (90-135 lbs. per acre of lime nitrate). Preparations for Spring sowings were somewhat retarded by late snowfalls, but they could be done under favourable conditions during these last weeks. Both the weather and the state of the soil were good. As during the winter it had not been possible to plow the land, seedings could not be completed everywhere, and in many cases they were delayed. Weather conditions however, were favourable to the germination and growth of the young plants.

Here are, expressed in percentages of a very good crop for the average of the country, the notations assigned to the different crops at the beginning of April:

	1942	1941	1940	1939	1938
Autumn wheat	80	78	63	83	83
Autumn rye	62	80	59	81	84
Autumn barley	70	80	64	81	85
Meslin	78	81	63	86	85
Spelt	80	82	64	83	85

Argentina: Plowing for the next seedings of cereals is hindered by drought prevailing now in the country.

United States: A winter wheat production of 375,000,000 centals (625,000,000 bushels) is indicated by April 1, 1942 conditions, according to the Department of Agriculture. This indicated production is 6.9 per cent. below the final estimate of the 1941 crop of 403,000,000 centals (671,000,000 bushels), but 2.4 per cent. above the 5-year (1936-40 average production of 366,000,000 centals (610,545,000 bushels).

Turkey: In order to put into practice the agricultural mobilisation decreed by the Government, the Ministry of Agriculture has charged the Agricultural Bank and the Bureau of the products of the land to prepare some stocks of cereal seedings. The same Ministry, by a circular note sent to all the vilayets, gives the necessary instructions for the distribution of seeds and the system of facilitations to be made by the banks that will grant credits to farmers willing to increase their crops. A capital of 2,600,000 Turkish pounds drawn from the funds of the Committee on coordination has been put aside for this purpose.

CURRENT INFORMATION ON MAIZE.

Bulgaria: Towards the end of February, the Ministry of Agriculture distributed among maize growers a circular recommending a more careful selection of maize seeds before seedings. This recommendation is to be attributed mostly to the preoccupation concerning the germinative condition of maize seeds as a result of the very cold winter.

Hungary: In order to insure the necessary quantities of fine quality seeds for seeding, the Hungarian Government decreed that all amounts of maize above five quintals (11 centals or 20 bushels) held by Hungarian citizens under any title whatsoever must be declared. Competent administrative and agricultural organs are entitled to take hold of the quantities of maize in excess of those needed by farmers for seeding and to return to them an equal amount of maize fit for animal feeding, basides paying them the difference of price between the two products. These regulations became effective on March 6 this year.

Argentina: The first official estimate puts the 1941-42 maize production at 202,826,000 centals (362,190,000 bushels) against 225,710,000 centals (403,055,000 bushels) in 1940-41 and an average of 169,115,000 centals (301,991,000 bushels) during the five preceding years. The crop of this year, although it is 10.1 per cent. lower than the excellent one of the year 1940-41, appears to be very abundant, especially if it is considered that the area sown to maize this year (12,300,000 acres) is 18.0 per cent. below that of the year 1940-41 and 22.6 per cent. below the average of the five preceding years. The excellent yields of the present season must be attributed exclusively to the very favourable weather conditions which lasted all through the vegetative cycle of the crop.

(Telegram April 29): The Argentine Government wired that maize yields in the chief producing centers of the country are excellent.

CURRENT INFORMATION ON RICE.

Romania: It is foreseen that the area which will be sown to rice this year will be greatly increased. The Romanian Government grants all sorts of facilitations to rice growers.

Argentina: According to the first official estimate published April 6 ult., the production of rice in 1941-42 is estimated at 2,425,000 centals (5,389,000 bushels), against 1,235,000 centals (2,743,000 bushels) in 1940-41 and an average 1,412,000 centals (3,137,000 bushels) in the five preceding years: percentages, 196,4 and 171,8. The excellent result of the present season was partly due to the increase of the area in the measure of 9.5 per cent. as compared with 1940-41 and 18.1 per cent. as compared with the average. The weather which was particularly favourable, contributed to a great extent to the excellent production of the rice crop.

CURRENT INFORMATION ON POTATOES.

Serbia: According to an article of the plan for the economy of the country, all farmers are obliged to raise potatoes. Whoever owns a piece of land under 1 hectare is obliged to sow to potatoes 3 ares (3,229 sq. feet) of it. Whoever owns 20 (2,5 acres) hectares (49 acres) or more, must sow at least 1 hectare (2,5 acres) to potatoes.

Each farmer must procure for himself the potatoes for seeding. Farmers can keep for their own needs and for sowing the necessary quantity of potatoes. All surpluses must be delivered to centers of supply.

Slovakia: The area to be sown to potatoes will be probably increased.

Sweden: Stored potatoes have kept well.

SUGAR SEASON

Information from most of the European countries regarding the area sown to sugar beets is, so far, limited and uncomplete. But it can be positively stated that the intention is to increase to the utmost the raising of this crop, as evidenced by frequent and minute decrees of the various Governments and Ministries. In some countries, Governments or Associations interested in sugar production carry on a more or less active propaganda to encourage beet growing. In every case, orders or advices are accompanied by various sorts of subsidies and facilitations, such as the distribution of fertilizers and selected seeds, advantageous transport terms, assurances regarding the labour supply and the offer of higher prices for sugar beets delivered at the factories. Naturally, if one thinks of the alimentary value of sugar in such periods of emergency as the present one, when the problem of alimentation is extremely urgent, one may easily understand the preoccupations of Governments and responsible authorities. Nor must it be forgotten that lately the value of sugar beets has increased both as a fodder crop and a producer of alcohol for carburants.

It is quite probable that the efforts of Governments and all the measures taken to insure a good sugar production which may suffice, as far as possible, to fill national needs, may be successful. Competition of other crops that are much sought after and very well paid for, as they are considered as good foodstuff as sugar, and whose culture is therefore equally encouraged by Governments and competent authorities, is much to be feared.

Up to now, a limited number of countries have answered the Institute inquiry on areas sown to sugar beets this year. On the basis of the replies that have reached the Institute it may be foreseen that a larger area than last year will be devoted to this crop in Belgium, Romania, Denmark, Switzerland, Hungary, Latvia and Serbia. An increase is also hoped for in Bulgaria, France and Italy; while in Sweden the area to sugar beets will equat that of last year. In Finland, owing to war conditions, a decrease of nearly 30 per cent. is expected. It is quite probable that Spain also will show a decrease of the beet area, because sugar beet growers prefer to devote their cares to more advantageous crops, since the price fixed by the Government for this product is estimated by farmers far too low.

Sugar beets seedings in Europe are late this year. Winter has been exceptionally severe and has lasted longer than expected, hindering plowing for several weeks. Snowfalls have been very abundant, and the very thick blanket of

snow lying long over the fields, made it impossible for farmers to do plowing and seeding. This state of affairs prevailed with varied intensity all over Europe, especially in the northern and central parts of the Continent where winter cold was intense. In southern countries, spring, though colder than usual, did not prevent timely seedings, at least within a certain limit. Damages due to late sowings are not beyond repair, because necessary works can be hastened and crops may recover the time lost in the course of the cold season. Thus the danger that this inconvenience may have a serious repercussion on the results of the harvest, will be avoided.

E. R.

CURRENT INFORMATION ON SUGAR.

Bulgaria: Measures have been taken by the Bulgarian Government to improve beet cultivations. Beet growers are obliged to choose, for their beet sowings, such varieties as are sure to yield a high percentage of sugar. In the future, the Ministry of Agriculture will fix the area to be sown to beets in order to cover, as far as possible, the needs of the country.

Denmark: This year the area sown to sugar beets is expected to amount to 120,000 acres. This means an increase of 2 per cent. over the 117,000 acres sown to the same crop in 1941, and 21 per cent. over the average area sown to beets in the five preceding years (99,000 acres).

Spain: According to agricultural experts, in the course of Spring works has been noticed a decrease of areas destined to the culture of sugar beets. This fact may be explained by the the low returns of the sugarbeet crop. Owing to the very low price fetched by this crop, farmers have preferred to sow their land to other more advantageous cultures, such as potatoes, flax, hemp etc.

According to press information, it appears ever more clearly that this year the area to sugar beets will be smaller than formerly. Before the civil war the average area to sugar beets amounted to 196,000 acres. In 1939 it amounted to only 89,000 acres, in 1940 to 158,000 acres and in 1941 to 161,000 acres. Forecasts for the present year are still less encouraging as the area to this crop will oscillate between 124,000 and 136,000 acres. This means that there will be a decrease of from 25,000 to 37,000 acres. The causes of this decrease are: the low price of sugar beets, which makes this crop unactractive to farmers, the lack of fertilisers, especially azotates, and the dearth of tractors and draft animals. On this account, some preoccupation is felt regarding the sugar supply of the country, which before the civil was war entirely covered by national production, while already in 1940 and 1941, in spite of severe rationing, large quantities of sugar had to be imported from Cuba.

France: In order to encourage the cultivation of beets, each beet grower who signs a regular contract for the 1942-43 season, will receive certain amounts of fertilizers in the following measure: 1 quintal (2,2 centals) of nitric and 1 quintal (2.2 centals) of potassic fertiliser at 49 per cent. for each hectare (2.5 acres) planted to beets according to the contract.

Hungary: At the end of March the Hungarian Government issued a decree for the regulation of the beet culture and sugar making. By this decree, factories are obliged to buy from beet growers, who are their customary furnishers, a quantity of beets not lower than that acquired in 1939. Naturally factories may acquire larger quantities, provided they are within the sugar producing capacity of the buying concern.

Latvia: The Sugar Central Bureau at Riga has decided that the area to be sown to sugar beets in 1942 must not be under 20,000 hectares (50,000 acres).

Romania: The Ministry of National Economy has decreed that the area to sugar beets this near must amount to 150,000 acres. This means an increase of about 25,000 acres over last year. The same Ministry has issued precise instructions regarding the relations between sugar beet growers and sugar factories. By these instructions it is established upon what conditions a farmer can be considered a sugar beet grower, because only qualided beet growers are entitled to sign contracts with sugar factories. The question of prices, purchase of seeds, delivery of the crop and granting of loans is also settled by the same ministerial decree.

Sugar consumption in Romania during the first quarter of 1942 has equalled that of the corresponding period in 1941.

Serbia: One of the most important among the measures which must be taken in Serbia under the controlled agricultural system, deals with the improvement of sugar beet production. After the loss of beet areas on account of the breaking up of the country, Serbia is obliged to increase its beet cultures. The beet areas of present Serbia covered about 10,000 acres, which were not sufficient for the production of the quantity of beets needed for the amount of sugar consumed in the country. It has now been decided that the area to be cultivated must amount to 37,000 acres, of which 18,500 is to be sown to beets for the factories of Belgrade and 18,500 for the factory of Chupria. A limited area will be sown in the district of Aleksinac, devoted exclusively to the production of seeds.

Sweden: The Central Bureau of Statistics communicates that at the beginning of April the area to be sown to sugar beets in the year 1942-43 had not yet been fixed, but according to a report of the Association of the Sugar Industry, it is estimated that it will amount to the same as in 1941, i. e , to nearly 132,000 acres. This area represents an increase of 2 per cent. as compared with the average of the last few years.

Switzerland: The Secretariat of Swiss Farmers communicates that this year the area to be sown to sugar beets, which last year amounted to 8,400 acres, will be increased in Switzerland about 500 acres, so that the total will be 8,900 acres. This figure indicates an increase of 28 per cent. over the average of the last five years.

CURRENT INFORMATION ON OLIVES.

Turkey: According to press information the 1041/42 production of olive oil is estimated at 1,213,000 centals (16,167;000 American gallons). This production is 83.3 per cent. higher than that of the year 1940/41 (661,000 centals or 8,818,000 American gallons), and 24.2 per cent. above the average production of the five preceding years (977,000 centals or 13,022,000 American gallons).

CURRENT INFORMATION ON VINES.

Portugal: In the following Table are contained data concerning the 1941 production of typical wines of Portugal. These data are compared with those of the production of 1940 and of the average for the years 1935-1939.

	1941	1940	Average 1935-39	% 1941: 1940 = 100	% 1941: Average = 100
	(Imperial gallons)				
Wines "verdes"	28,482,956	20,912,257	32,963,241	136.2	86,4
Wines of the Douro region .	14,602,546	11,458,018	10,821,233	127.4	134.9
Wines of the Dão region . .	13,890,859	6,353,552	12,424,150	218.6	111.8
Wines of the Carcavelos region	4,971	6,093	10,823	81.6	45.9
Totals . . .	56,981,332	38,729,920	56,219,447	147.1	101.4
	(American gallons)				
Wines "verdes"	34,205,469	25,113,741	39,585,889	136.2	86.4
Wines of the Douro region .	17,536,345	13,760,049	12,995,328	127.4	134.9
Wines of the Dão region . .	16,681,673	7,630,045	14,920,288	218.6	111.8
Wines of the Carcavelos region .	5,970	7,318	12,997	81.6	45.9
Totals . . .	68,429,547	46,511,153	67,514,502	147.1	101.4

Especially important are the the light "verdes" wines for the table which are produced in the North of the country in the vast regions extending from the litoral to the mountains of Traz-os-Montes, where the yearly production averages 20 per cent. of the country's total.

Romania: Vines which were not planted during the winter, were damaged by the exceptional cold.

CURRENT INFORMATION ON FLAX.

Romania: During the 1941 season, the area sown to flax was increased 250 per cent. as compared with 1940. According to the plan for 1942, the flax crop will be increased 600 per cent. as compared with 1941.

Argentina: Drought during the month of April has retarded plowing for the next flax seedings.

WORLD COTTON SITUATION

by I. Salto

The present cotton season (August 1, 1941-July 31, 1942) the third since the beginning of the war, coincides with the nearly complete suppression of the last sources of statistical and commercial information. One after the other, governments have suspended the publication of current statistics, and in many countries stock exchanges have been closed and the cotton trade, spinning, weaving, and distribution of manufactured cotton goods have been put under State control.

The cotton situation at present is so confused and available data are so fragmentary that in the analysis of facts which are so badly or little known, one must proceed with the utmost precaution. It goes without saying that forecasts as well as the study of prospects do no longer rest on well ascertained facts, and therefore their value is extremely limited. And besides it must be aknowledged, that for the time being, a survey of the cotton situation from an international point of view is of a very small practical interest if not for all, at least for the great majority of countries.

Available information goes generally back to the beginning of 1942 and is mostly drawn from the documentation prepared by the Department of Agriculture of the United States, which in its turn makes use also of statistics prepared by the New York Cotton Exchange. Availing ourselves of these sources and of other information, and by filling gaps with approximate estimates, we will attempt to give as complete a picture as possible of the 1940/41 season and to sketch the most important traits of the present 1941/42 season.

Production of ginned cotton.

Before undertaking the analysis of production, we deem it useful to give an idea of the present situation under war conditions.

From the point of view of cotton production, the world is subdivised in three groups without any trade relations between each other.

We will indicate them by the letters *A*, *B* and *C*.

Group *A* includes the whole of America and Africa, Asia without the parts occupied by the Japanese, the Soviet Union without Ukraine and Crimea, Australia.

In group *B* are found Japan, Manchoukuo, the China of Nanking, Corea, French Indochina, Thailand, nearly the whole of the cotton zone of Burma, the Netherlands East Indies and the Philippines.

Group *C* includes Bulgaria, Greece, Italy, Romania, Serbia, and about 700,000 acres sown to cotton in Ukraine and Crimea, until 1940.

Outside of these three groups which, as we have already mentioned, carry no further commercial exchanges between each other, there is a number of neutral countries: Spain, whose production as compared with her needs, is insignificant; Turkey, whose foreign trade has much declined and whose cotton

production is almost entirely absorbed by her defense necessities; Portugal which imports a part of the cotton produced in its African colonies; Switzerland and Sweden, which, now and then were allowed free passage through the different blockades for small quantities of cotton.

In the following Table we have attempted to give numerical consistency to this subdivision of world cotton production.

Relative importance of the groups A, B, C.

Years	Group *A*		Group *B*		Group *C*		Totals	
	Thousand of Metric Tons	Percent. of total	Thousand of Metric Tons	Percent. of total	Thousand of Metric Tons	Percent. of total	Thousand of Metric Tons	Percent. of total
1941-42 (*)	5,900	95.2	270	4.3	30	0.5	6,200	100.00
1940-41 (*)	6,280	95.2	260	3.9	60	0.9	6,600	100.00

(*) Provisional data.

For some countries, the figures of the present season, as well as those of the previous one, are provisional or represent only attempts at forecasts. Still this fact is not such as to considerably modify the results of the Table or the degree of relation between the different groups.

The salient feature is that Group *A* alone produces 95 per cent. of the cotton world total. We will have to mention again this tripartite subdivision when we will examine the consumption, trade and stocks of cotton. We will only say now that Group *A* produces a far larger amount of cotton than it needs, in spite of the fact that it includes such industrial, economic and demographic units as the United States, the Soviet Union, India, and the United Kingdom. Group *B* produces very little cotton as compared with its necessities; while Group *C* has practically no cotton, in comparison to its textile industrial potentiality.

World production of cotton.

Cotton years	World production	Production of the U. S. A.	Per cent. of American cotton to world production
	(000 Metric Tons)		Per cent.
Average 1924/25 to 1928/29	5,700	3,260	57
» 1929/30 to 1933/34	5,660	3,120	55
» 1934/35 to 1938/39	6,440	2,780	43
1938/39	6,320	2,590	41
1939/40	6,270	2,560	41
1940/41 (*)	6,600	2,720	41
1941/42 (*)	6.200	2.380	38

(*) Provisional data.

When the war broke out, cotton trade and consumption suddenly soared, so that in the Spring and Summer 1940, when nearly the whole of the sowings of the 1940/41 crop were executed, Governments and Farmers were quite optimistic over cotton prospects, because the situation was generally better than the year before from almost every point of view. The result was that nearly all countries increased their production as compared with the year 1939/40, except the U. S. S. R. where production decreased by about 100,000 metric tons (from 880,000 to 780,000) owing to adverse climatic conditions at the time of sowing and picking. World production went up from 6,270,000 to 6,600,000 metric tons. But the boom of cotton trade and consumption was a short-lived phenomenon, because in the summer of 1940 hostilities took such a turn as to utterly upset the world market.

In 1941 a large number of the cotton producing countries, especially the United States and Egypt, began to feel the effects of the international situation created by the war, which caused a vertical fall of exportations. Customary clients would or could no longer make purchases as before, transports became difficult, freights and insurance charges skyrocketed. Besides, the rare clients who still asked for small quantities of cotton, were only Governments that purchased outside the exchanges, imposing their conditions, chiefly guided, in these operations, by political views. The consequences were that the area sown to cotton began to be reduced in the United States (23,519,000 acres against 24,871,000 in 1940), where the acreage was even smaller than that authorised by the law. The same happened in Egypt and in other countries of lesser importance. In the U. S. S. R., on the contrary, the cotton area remained the same as in the two preceding years, *i. e.*, about 5,200,000 acres. China, India, and apparently also Brazil, must have registered small increases.

Three quarters of the 1941/42 season is already over, and practically all cotton has been picked; but official statistics are rare. Available data, however, make it possible to estimate the whole area sown to cotton all over the world at about 74 million acres, *i. e.*, about 3,700,000 less than in 1940/41 and slightly below the figure of 1939/40.

In the United States, the 1941 production amounted to almost 2,380,000 metric tons of ginned cotton, with a decrease, compared with the 1940 crop, of nearly 13 per cent. and nearly 17 per cent. as compared with the average of the five years 1935/39. It is estimated that production in the U. S. S. R. amounted to no more than 700,000 metric tons, and that India and China harvested respectively about 1,000,000 and 500,000 metric tons. All together, world production can be estimated at about 6,200,000 metric tons.

This is the fourth year in succession that production is over 6 million metric tons. Thus world surpluses cannot decrease; because, in spite of all efforts, consumption too remained stationary, even in the most favourable years, around 6 million metric tons. If the fact is taken into account that world stocks taken all together amount to 5 million metric tons of which 3 millions (*i. e.*, 60 per cent.) are represented by American cotton produced in the United States, it can be seen how heavily this surplus stock weighs on the cotton policies of the different Gouvernment.

The entry of the United States and Japan in to the war (December 1941) upset the cotton situation altogether. From now on, as long as the war lasts, the cotton problems can only be solved within each one of the groups mentioned above (*A*, *B*, *C*), by all the means at the disposal of each one of them, and separately. Apparently this means that most of the countries of Group *A*, sooner or later, may be forced to reduce their cotton production in a more or less large measure unless they find other issues, more convenient to their interests, as for example the piling up of increasing cotton stocks, to be employed when the war is over.

In Egypt, where the 1942 sowings are just over, only 50 per cent. of the average cotton area has been cultivated to this crop and a reduction of the area to be sown to cotton in the Spring 1943 is already under consideration, the amount of which may be even as high as 70 per cent. of the average. Probably a more or less like reduction has been effectuated in most of the other cotton producing countries of Africa. In the countries of Asia, except the U.S.S.R. on the contrary, no reduction of the cotton area is expected, especially in India, where cotton consumption is increasing. Labour and possible markets for Indian cotton are not lacking, while in the Soviet Union the needs of soldiers and workmen for the war industry, must be acute. So that probably this year it will be impossible to keep cotton production up to the same level as in 1940 and 1941, while at the same time greatly increasing the production of cereals, sugar beets, and other fodder and oleagineous crops. But, as to this probable reduction of cotton production corresponds a growing increase of the consumption by war industries, it is possible that a trade stream may be created between Russia and the other Asiatic cotton producing countries, which would certainly have a favourable influence on their production. Nor is to be excluded that Egypt may also export its cotton to the U. S. S. R.

North and South America have produced, during the season 1941/42, something like 3,200,000 metric tons of cotton. At August 1, 1941 the surplus stocks must have amounted to about the same figure, 2,800,000 of which belonging to the United States. This makes a total available supply for the season, of from 6,300,000 to 6,500,000 metric tons on a world total of 11,000,000 *i. e.*, about 60 per cent. of that total. Quantities exported from the American continent between August 1, 1941 and July 31, 1942, can hardly amount to 300,000 metric tons, and total consumption to 2,600,000: total of 2,900,000 on the whole. At the end of the season there would be, therefore, a surplus stock of from 3,400,000 to 3,600,000 metric tons. The Government of the United States, however, has decided that the national acreage allotment must be the same as that for the past 4 years: 27,400,000 acres, while in Argentina too, an increase of the cotton acreage is contemplated for the Fall of 1942 to replace cereals.

If the war lasts, exports will be further reduced and consumption will fall to a lower level as soon as the Government of the United States will no more transfer to the textile industry such enormous orders for war needs, as now. In view of the existence of heavy stocks at the end of the present season, and on the basis of prospects, it may be estimated that in the year 1943 there will be a large decrease of area sown to cotton in order to limit the production of the

whole American continent, unless the interested Governments do not decide to accumulate and finance even larger surplus stocks than those available at present, considering that a huge reduction of the cotton production may be worse from a social and political point of view.

The situation of stocks at the 1st of August, 1941.

Information concerning cotton stocks at the beginning of the present season, though fragmentary and uncomplete concerning their location, is approximately complete in regard to their total according to the principal qualities. In the following Table we have tried to put together all this information, so as to make it comparable with similar statistics published last year.

The world stock at the beginning of the 1941-42 season (estimated at about 5,000,000 metric tons) is nearly equal to 80 per cent. of the world total production foreseen for the present season.

Estimate of the world cotton stocks at the beginning of the season.

(000 Metric Tons)

Date		American	Indian	Egyptian	Sundries	Total
August 1, 1941 (*)	a)	2,340	...	...	...	...
	b)	570	...	...	...	...
	Total	*2,910*	*460*	*340*	*1,290*	*5,000*
August 1, 1940 (*)	a)	2,460	270	180	800	3,710
	b)	370	50	50	320	790
	Total	*2,830*	*320*	*230*	*1,120*	*4,500*
August 1, 1939 (*)	a)	2,830	250	120	510	3,710
	b)	330	210	80	440	1,060
	Total	*3,160*	*460*	*200*	*950*	*4,770*
August 1, 1938	a)	2,630	420	160	660	3,870
	b)	450	300	80	310	1,140
	Total	*3,080*	*720*	*240*	*970*	*5,010*

(*) Preliminary estimate. — (*a*) Visible stocks (in warehouses, ports, afloat etc.). — (*b*) Invisible stocks (in spinning mills).

The world stock of American cotton, *i. e.*, cotton produced in the United States, shows a small increase over August 1, 1940. In the following Table are contained the figures relative to stocks in the United States.

The increase of stocks in the United States has been greater than that of the world stock. This fact is accounted for by the excessively low amount of exportations, which has been the lowest since the civil war, and a consequent reduction of nearly 60 per cent. of the American stock outside the United States in the course of a year. If consumption in the United States had not been above all forecasts, even the most optimistic, this stock would have increased

still more and would have been higher than the average yearly production. Consumption in the United States, in fact, went from 1,730,000 metric tons in 1939/40 to 2,130,000 in 1940/41, an increase of 23 per cent.

Stocks of American cotton in the United States at the beginning of the season.

(000 Metric Tons)

Date	Visible stocks	Invisible stocks	Total
August 1, 1941 (*)	2,150	560	2,710
August 1, 1940	2,030	320	2,350
August 1, 1939	2,710	190	2,900
August 1, 1938	2,280	270	2,550
August 1, 1937	710	270	980

(*) Provisional data.

The American stock of August 1, 1941 is constituted of 1,480,000 metric tons of cotton in the hands of the American Governement, and 1,230,000 metric tons of *free* cotton. The year before, the figures were respectively 1,950,000 and 400,000 while at August 1, 1939 they were 2,460,000 (top figure) and 440,000. The decrease of the stock belonging to the Government is due mostly to the fact that, as the prices of cotton had reached a very high level, cotton owners who had not yet given up their rights found it convenient to pay their debt to the Government, withdraw their cotton and sell it at current prices. The Government, in its turn, sold for exportation the cotton of the 1937 crop, which was entirely its property, at a low price, adding also an export premium for the quantities destined to Canada. This was done in order to beat competition from Brazil. A part of the stocks is used by the Government to meet engagements taken with some countries through the Lend-Lease Act. As for the stocks of the other qualities, only the totals published by the New York Cotton Exchange and included in the preceding Table are available. It is reasonable to believe that the stock of *Indian* cotton (i. e., cotton produced in India) is about normal or even insufficient for the increased needs of Indian consumption after the entry of Japan into the war. In fact, the Indian textile industry is called to replace Japanese products both at home and on the markets which were before supplied by Japan. Indian cotton is also called to replace British textile industry, which has almost entirely given up Asiatic and African markets and has concentrated its efforts on the American market in order to get dollars or other moneys that can be changed into dollars. Indian possibilities at present are enormous, and find a limitation only in the difficulty of transportation. Indian production of medium and long staple cottons is increasing. Cottons from Egypt, Sudan and East Africa are at its disposal. Its textile industry is going through a period of great development. Mechanical power, labour and means of transportation

are not lacking in India. Orders for war needs are enormous and urgent. Demand from such markets as Egypt, South Africa, Australia, Iran, the Near East countries, the Soviet Union, China of Chung-king, leaving home demand aside is growing and pressing. The course of events have given India again its fonction and millenarian avocation of being a great cotton market and mill. Nor must it be overlooked that India nearly possesses the monopoly of jute production and that its industry of synthetic fibres is strongly developping.

The stock of Egyptian cotton, i. e., cotton produced in Egyypt, is very high. This accounts for the reduction of cotton production in that country. Egyptian long staple cottons find a limited field at present, as the chief consumers of this product, the United Kingdom and the European continent, are forced by war to do without it. Manufactured goods consumed by war are not made of cottons « de luxe », except for a very small quantity for which British industry can avail itself of the excellent Sea-Island cotton of the British West Indies. The Egyptian textile industry is developping, but it produces only fine qualities made of Egyptian cotton, as the importation of cheap cottons is forbidden. This is the reason why the country is forced to limit to a maximum the production of cotton as long as the war lasts. As regards « sundry » cottons, *i. e.*, the ensemble of other cottons produced in America, Africa, Asia and Europe, a new increase is registered, which is undoubtedly noticeable in America (Brazil, Argentina, Peru and Mexico) and in Africa. The volume of this stock, which as long as the war goes on is destined to increase rather than to decrease, will exert its pressure on production. In this case, it is mostly question of countries which export all the cotton they produce, or else they just consume on the home market a small fraction of their production in a textile industry which is, more or less, embryonary. Even if that industry could take advantage of present circumstances and have a quick development, its home market would still be limited and mostly poor.

The distribution of stocks among the three A, B, C groups was very unequal. The great bulk of 5,000,000 metric tons constituting the world stock at the beginning of the 1941/42 season, was concentrated in Group A. Group B had probably something like 200,000 metric tons and Group C only negligible quantities.

World supply of all cottons in 1941-42.

In the present season, we may count on a world production of about 11,000,000 metric tons of commercial ginned cotton.

As may be seen by the following Table, since the 1937/38 season when world cotton production and stocks amounted to the top figure of 11,150,000 metric tons this is the fifth year in succession when stocks vary around 11,000,000 metric tons of which nearly 50 per cent. is America cotton.

The lowest figure of the world supply during these 5 years is that of 1939-40. It is not difficult to foresee that the highest figure will be that of the next season, except in case of a considerable decrease of production.

As regards the distribution of stocks between the three Groups A, B, C, it is evident that it is the same as that of production and stocks.

World supply and consumption of all cottons.

(000 Metric Tons)

Year	Carry over at August 1	World commercial production	World Supply of all cotton (*)	World consumption
1942-43	5,850	...	...	...
1941-42	5,000	6,000	11 000 (5,290)	5,150
1940-41	4,500	6,400	10,900 (5,550)	5,900
1939-40	4,770	6,000	10,770 (5,720)	6,270
1938-39	5,010	6,100	11,110 (5,670)	6,340
1937-38	3,050	8,100	11,150 (5,510)	6,140
1936-37	3,020	6,780	9 800 (4,300)	6,750

(*) Figures in a parenthesis indicate the amount of world supply of American cotton (cotton produced in the United States).

Consumption, Trade and Prices.

The highest point in the world consumption of all cottons was reached in 1936/37, with a total of 6,750,000 metric Tons of which 2,900,000, or nearly 43 per cent, was *American* cotton. In the three following years, consumption varied between 6,100,000 and 6,300,000 metric tons. Since 1939/40 the curve has fallen down.

The countries that still consume large quantities of cotton are: the United States, the United Kingdom, the U. S. S. R., India, Japan, China and Canada.

Consumption in the United States has gone on growing since the Summer of 1939. But it is only after October 1940 that it took extraordinary dimensions going up to and even above 200,000 metric tons a month. At the same time, production of synthetic fibres has also taken ever greater proportions [1].

Among the other large cotton consuming countries, only India and Canada register such progressive and uninterrupted increases as the United States. The

[1] In 1940 the production of rayon and staple fiber in the United States amounted to 210,000 metric tons, *i. e.*, almost 20 per cent. of world production. Owing to Government orders and to the total lack of natural silk, the progress and extension of production are such as to justify the belief that in the present year it will make a considerable bound. We will notice, by the way, that world production of rayon and staple fiber in 1941 amounted to 1,260,000 metric tons, against 1,120,000 in 1940 and 770,000 as an average for the five years 1935/39. This means an increase of 12.5 per cent. over 1940 and nearly 64 per cent. over the average. In 1940 for the first time the production of staple fiber was greater than that of rayon, and in 1941 rayon represented only 47 per cent. of total world production. Germany and Italy are the greatest producers of synthetic fibres. These two countries together yield 76 per cent. of the European production and 44 per cent. of world production. As regards the tripartite distribution, the situation is reversed: group C ist the first, with over one half of the world supply, followed by group A, while group B occupies last position.

United Kingdom has considerably limited its consumption of cotton for civilian uses and for exportation. Probably the same thing has happened in the Soviet Union.

In the exporting countries, great efforts are naturally made to increase consumption and exports as much as possible. This is the reason why the substitution of cotton to jute in packing is made obligatory, and fashion is directed to encourage the use of cotton instead of silk and other textiles both for male and woman apparel. Exportation is encouraged and subsidised by all means in order to beat the prices of competing countries. But the number of cotton importing countries is now very limited, and probably these efforts will not last long.

As regards prices, the closing of he Liverpool Cotton Exchange on March 31, 1941 created the most complete confusion in this field which had already become very complicated. Since then, prices are practically what Governments that buy and those that sell decide between themselves. It is true that in some places, as New York, New Orleans, São Paulo, Bombay, Osaka, Shanghai, certain prices for cotton are fixed; but they are of no practical value on the international market, which, at the present time, is regulated only by circumstances, very often outside of all economic considerations.

To give an idea of this abnormal situation, one has only to mention that Canada, which in the past used a very small amount of Brazilian cotton, has imported in 1941-42 and consumed more Brazilian than American cotton at very convenient prices notwithstanding the enormous distance.

On the other hand, Japan which in 1941 had the greatest interest in importting large quantities of cotton from South America, could do it only in a very small measure on account of the lack of tonnage, and has bought more cotton in the United States than it would have wished to do.

These new aspects of trade and prices deserve a deeper study, and it is our intention to take this matter up again in the near future.

CURRENT INFORMATION ON COTTON.

Spain: According to press information the cotton crop this year appears to be growing well.

Romania: According to the plan for the year 1942, the cotton crop will be increased by 200 per cent. as compared with 1941.

Argentina: According to the first estimate, cotton production in Argentina during the year 1941-42 is forecast at about 369,000 bales of 478 lb. net weight. Last year too the first forecast indicated the same quantity of 369,000 bales, which at the final estimate was reduced to about 232,200 bales. Annual average production during the five preceding years ending 1939-40 has amounted to about 288,800 bales.

Egypt: On January 12, 1942 the Minister of Agriculture communicated that the Council of Ministers had decided on a further reduction of area cultivated to cotton by utterly forbidding the growing of this crop in the land of the basins irrigated by

the swelling of the Nile or by mechanical pumping directly from the Nile in the high valley of the river. Two days later the Superior Council of Agriculture decided that the culture of cotton in the Delta shall be limited to 22 per cent. of the whole area sown by each farmer, instead of 27 per cent. as had been established by a previous law; while in the rest of the country (with the exception of the lands of the basin) the percentage fell to 23 and 15 per cent. These measures were approved by the Chamber of Deputies on January 24 and by the Senate on the 25th of the same month. On the basis of this information, it must be estimated that the area which has just been sown to cotton, amounts to about 986.000 acres against 1.706.000 in 1941 and 1.824.000 as an average for the year 1936-1940. This figure shows a decrease of 42 per cent. compared with last year and 46 per cent. compared with the average. In order to find as low figures as these, one must go back to the last decade of the XIX century. The official estimate of the cotton area will be made known on July 15, 1942. As regards the next crop, due account must be taken of the fact that this year cotton will be grown on high-yielding soil, on account of the heavy limitation of areas left to this crop. Consequently the effects of the lack of fertilisers will not be so heavily felt. It may be estimated that the yield per acre will be 450 lbs., against an average of 510 lbs. per acre in the years 1936-1940. Total production may be estimated at 4.409.000 lbs., i. e., 45 per cent. less than in 1941 (7.992.000 lbs.) and 52 per cent. below the average of the years 1936-1940 (9.189.000 lbs.). The first official estimate on production will be published only on Monday, October 5, 1942.

CURRENT INFORMATION ON HEMP.

Romania: During the 1941 season, the area sown to hemp was increased 150 per cent. as compared with the year 1940. According to the plan for 1942, the hemp crop will be further increased 300 per cent. as compared with 1941.

CURRENT INFORMATION ON TOBACCO.

Bulgaria: According to recent official information, Germany has bought 93 million lbs. of tobacco of the 1941 crop. Germany has also arranged to buy the bulk of the Bulgarian tobacco crop of the year 1942. This means that the area sown to tobacco in 1942 will be increased.

Romania: The area to be sown to tobacco in 1942 has been fixed at 86.500 acres.

Southern Rhodesia: According to press information, the 1941/42 production of tobacco is estimated at 45,000,000 lbs., against 34,569,000 in 1940/41 and an average of 25.855,000 in the five preceding years. Percentages: 130.2 per cent. and 174.0 per cent.

CURRENT INFORMATION ON OTHER PRODUCTS.

Soya.

Bulgaria: At the beginning of March, the Ministry of Agriculture gave instructions to its Bureaus to hasten the distribution of soya and sunflower seeds to farmers. For this purpose, the storerooms of the *Direction for the Purchase of Cereals* had been filled with large quantities of seeds of these two oleagineous plants. It is estimated

that this year there will be a large increase of area sown to oleagineous grains, especially soya, which according to the plan prepared by the Ministry of Agriculture, should amount to 70.000 hectares (173,000 acres).

Croatia: This year, the Ministry of Agriculture has distributed to farmers 7,000 quintals (15,400 cental or 27,600 bushels) of soya seeds. The same Ministry has also distributed among farmers thousands of propaganda pamphlets to encourage the cultivation of soya.

Jute.

India: The Calcutta government has again strongly insisted that in 1942 jute producers must sow to jute only one half of the area sown to that product in 1941, because present circumstances are such as to make the cultivation of alimentary products much more important than that of jute.

CURRENT INFORMATION ON FODDER CROPS.

Switzerland: Natural and artificial meadows went well through the winter under the protection of a heavy coat of snow. Grass appears vigorous and thick, and shows no sign of having been damaged by frost or cold. The growth of the grass has been somewhat retarded by the coolness of the temperature, but it appears in a satisfactory condition. Rust has done some damage here and there. The state of the culture at the first of April 1942 was 80 (according to the system of the country) for artificial meadows, against 81 at the first of April 1941, 75 at the first of April 1940 and 79 for natural meadows, against 80 and 78 at the corresponding date of the two preceding years.

Argentina: Rainfalls in the month of March improved the condition of pastures over the country taken as a whole.

LIVESTOCK AND DERIVATIVES

PIGS IN DENMARK *).

(Thousands)

Classification	1942 March 21	1942 Feb. 7	1941 Dec. 27	1941 Nov. 15	1941 Oct. 4	1941 Aug. 23	1941 July 12	1941 May 30	1941 April 19	1941 March 8
Boars for breeding.	8	8	9	9	10	11	11	11	11	11
Sows in farrow for first time . . .	27	20	23	28	44	57	78	74	64	45
Other sows in farrow	60	67	69	68	79	86	85	87	87	93
Sows in milk . . .	30	34	42	50	59	61	53	47	51	45
Sows not yet covered (and not for slaughter) .	19	20	22	27	24	22	17	18	15	17
Sows for slaughter.	9	11	16	21	18	10	7	8	7	11
Total sows	*145*	*152*	*172*	*194*	*224*	*236*	*240*	*234*	*224*	*211*
Sucking pigs not weaned	229	246	326	398	494	515	440	390	429	364
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg. . .	329	409	513	534	524	462	420	432	409	455
Pigs of 35 and under 60 kg. .	327	387	424	416	401	399	405	366	419	473
Fat pigs of 60 kg. and over .	229	266	247	374	360	317	254	288	333	359
Total pigs . . .	*1,267*	*1,468*	*1,691*	*1.925*	*2,013*	*1,940*	*1,770*	*1,721*	*1,825*	*1,873*

*) Rural districts only.

THE NUMBER OF SHEEP IN DENMARK.

At February 7, 1942 the number of sheep was 108.729 against 147.070 at July 15, 1939, 187.040 at July 17, 1937 and 174.584 at July 15, 1933.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Croatia: According to information from the Milk Central Bureau, the number of cattle heads in Croatia amounts to 1,944,126. Lately, the production of milk has reached 181 million Imperial gallons (218 million American gallons) a year. Of this amount, 86.2 per cent. are cow milk, 10 per cent. ewe milk and 3.8 per cent. goat milk. Each year from 7 to 4 million Imperial gallons (8-11 million American gallons) of milk are transformed into milk derivatives.

France: In the occupied French territory a census of horses, mules, asses, cattle, hogs and goats will be taken between the 1st and the 12th of May.

Romania: During the winter a number of pigs and other small livestock died on account of the exceptional cold. About the end of the month of March the health condition of livestock was good.

Switzerland: According to the first results of surveys made by the Bureau of information on prices of the Swiss Farmers' Union in the month of February 1942 the delivery of milk to cheese and milk factories in Switzerland was, on the average, 10.6 per cent. less than in February 1941. The ascertained decrease is somewhat higher than that of the previous months and must be attributed to the new reduction in the number of cows and to the dearth of forages in some places. It must be remembered however that milk deliveries in February 1941 had been 2,6 per cent. higher than in the same month the year before; so that, as compared with the month of February 1940, the real decrease has been of 8 per cent., that is about the same as the decrease in the number of cows.

Argentina: In March, the health condition of cattle was generally good.

CURRENT INFORMATION ON SERICULTURE.

Romania: During the present season the Government will give the maximum impulse to sericulture. Besides the silk worms eggs produced in the national stations, others will be imported from Bulgaria and Italy. The Chambers of Agriculture will distribute the eggs to the farmers and will aid them to buy the amount they need.

TRADE

PORTUGAL

Products and Units	January				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1942	1941	1942	1941	1942 or 1941-42	1941 or 1940-41	1942 or 1941-42	1941 or 1940-41	1941 or 1940-41	1941 or 1940-41
Wheat: 1,000 centals	0	0	22	22	0	0	1,872	1,931	0	2,251
» : Thous. bush. of 60 lb.	0	0	37	37	0	0	3,120	3,219	0	3,752
Wheat flour: 1,000 centals	0	0	0	0	3	0	10	15	0	18
Wheat flour: Thous. bush. of 196 lb.	0	0	0	0	2	0	5	8	0	9
Maize: 1,000 centals.	0	0	60	1	0	0	303	223	9	1,742
» : Thous. bush. of 56 lb.	0	0	108	2	0	0	541	398	17	3,111
Rice: 1,000 centals	0	0	0	0	0	0	0	0	38	86
» : Thous. bush. of 45 lb.	0	0	0	0	0	0	0	0	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	0	0	11
Linseed: Thous. bush. of 56 lb.	0	0	0	0	0	0	0	0	0	19
Cotton: 1,000 centals	0	0	47	2	0	0	302	175	0	427
» : Thous. bales of 478 lb.	0	0	10	1	0	0	63	37	0	89
Wool 1,000 lb.	0	0	7	2	0	0	778	130	0	7,086
Butter: » »	35	22	0	0	35	22	0	0	313	0
Cheese: » »	11	18	0	0	11	18	0	0	317	20
Cacao: » »	0	0	18	108	2	0	611	939	119	2,597
Tea: » »	—	—	13	11	—	—	201	194	—	492
Coffee: » »	0	84	498	571	273	2,189	2,983	8,433	3,305	15,413

ROMANIA: Exports.

Products and Units		January		Total from the beginning of the season *)		Total of the season *)
		1942	1941	1941-42	1940-41	1940-41
Wheat	1,000 centals	10	0	103	15	18
	Thous. bush. of 60 lb.	17	0	172	25	30
Barley	1,000 centals	0	166	44	1,125	1,138
	Thous. bush. of 48 lb.	0	346	92	2,344	2,370
Oats	1,000 centals	0	17	0	191	200
	Thous. bush. of 32 lb.	0	52	0	596	626
Maize	1,000 centals.	2	206	21	739	3,305
	Thous. bush. of 56 lb.	4	368	38	1,320	5,902

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat, wheat flour, rye, barley, oats and cotton; September 1st for wool; October 1st for cacao, November 1st for maize.

SWEDEN: Imports.

Products and Units		February 1942	February 1941	Total from the beginning of the season *) 1941-42	Total from the beginning of the season *) 1940-41	Total of the season *) 1940-41
Wheat	1,000 centals	0	0	1	277	277
	Thous. bush. of 60 lb.	0	0	1	461	461
Rye	1,000 centals	0	0	0	835	835
	Thous. bush. of 56 lb.	0	0	0	1,491	1,491
Maize	1,000 centals	0	0	52	170	695
	Thous. bush. of 32 lb.	0	1	163	533	2,172

ECUADOR: Coffee exports.

Coffee exportation from the Republic of Ecuador in the month of September 1941 has been of 5,818,019 lb.: 5,769,517 lb. to the United States and 48,502 lb. to Chile.

SPAIN: Trade for the six months 1941 (January 1.-June 30).

Products and units		Exports	Imports	Products and units		Exports	Imports
Wheat	1000 centals	—	4,196	Linseed	1000 centals	0	24
»	Thous. bush. of 60 lb.	—	6,993	»	Thous. bush. of 56 lb.	0	43
Wheat flour	1000 centals	96	166	Cotton	1000 centals	1	484
» »	Thous. bbl. of 196 lb.	49	85	»	Thous. bales of 478 lb.	0	101
Barley	1000 centals	—	34	Wool	Thousand pounds	893	256
»	Thous. bush. of 48 lb.	—	71	Butter	Thousand pounds	66	4
Maize	1000 centals	5	3,776	Cheese	Thousand pounds	159	15
»	Thous. bush. of 56 lb.	9	6,743	Cacao	Thousand pounds	—	10,897
Rice	1000 centals	32	353	Coffee	Thousand pounds	—	3,188
»	Thous. bush. of 45 lb.	70	785				

PORTUGUESE GUINEA.

Products and Units		October 1941	October 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.						
Wheat flour	1000 centals	0	0	1	0	1
» »	Thous. bush. of 196 lb.	0	0	1	0	1
Butter	1000 lb.	2	2	24	15	18
Cheese	» »	4	0	15	9	...
Exports.						
Rice	1000 centals	0	4	112	161	161
»	Thous. bush. of 45 lb.	0	9	250	258	358

*) See note page 130.

CAPE VERDE ISLANDS: Imports.

Products and Units	August 1941	August 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Wheat flour . . . . 1000 centals	3	3	3	3	19
» » . . . . Thous. bush. of 196 lb.	1	1	1	1	10
Rice . . . . 1000 centals	3	1	26	13	17
» . . . . Thous. bush. of 45 lb.	7	3	57	30	38

MOZAMBIQUE.

Products and Units	August 1941	August 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.					
Wheat flour . . . . 1000 centals	8	10	8	10	149
» » . . . . Thous. bush. of 196 lb.	4	5	4	5	76
Rice . . . . 1000 centals	19	17	102	94	125
» . . . . Thous. bush. of 45 lb.	42	37	226	210	278
Butter . . . . 1000 lb.	40	44	437	423	611
Cheese . . . . » »	33	7	163	132	198
Coffee . . . . » »	44	18	68	...	...
Exports.					
Tea . . . . 1000 lb.	108	46	132	...	...

TIMOR AND CAMBING.

Products and Units	August 1941	August 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940-41
Imports.					
Wheat flour . . . . 1000 centals	0	0	0	0	2
» » . . . . Thous. bush. of 196 lb.	0	0	0	0	1
Exports.					
Coffee . . . . 1000 lb.	428	7	690	9	1,784

*) See note page 130.

ANGOLA.

Products and Units	July 1941	July 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.					
Butter . . . 1000 lb.	2	2	15	18	33
Cheese . . . » »	2	9	35	51	93
Exports.					
Rice . . . 1000 centals	2	7	16	12	25
» . . . Thous. bush. of 45 lb.	5	15	36	26	55
Coffee . . . 1000 lb.	55	150	55	150	17,174

PORTUGUESE INDIA: Imports.

Products and Units	May 1941	May 1940	Total from the beginning of the season *) 1941 or 1940-41	Total from the beginning of the season *) 1940 or 1939-40	Total of the season *) 1940 or 1939-40
Wheat . . . 1000 centals	9	...	57	...	...
» . . . Thous. bush. of 60 lb.	15	...	94	...	...
Wheat flour . . . 1000 centals	3	...	34	...	...
» » . . . Thous. bush. of 196 lb	1	...	18	...	...
Maize. . . . 1000 centals	2	1	11	9	15
» . . . Thous. bush. of 56 lb	3	2	20	16	26
Rice . . . 1000 centals	57	53	294	287	543
» . . . Thous. bush. of 45 lb.	127	117	654	639	1,208
Butter . . . 1000 lb.	22	26	137	143	337
Tea . . . » »	9	...	99	...	..

SAO TOME AND PRINCIPE ISLANDS.

Products and Units	April 1941	April 1940	Total from the beginning of the season *) 1941 or 1940-41	Total from the beginning of the season *) 1940 or 1939-40	Total of the season *) 1940 or 1939-40
Imports.					
Wheat flour . . . 1000 centals	1	1	5	5	6
» » . . . Thous. bush. of 196 lb.	0	1	3	2	3
Maize. . . . 1000 centals	4	5	26	21	37
» . . . Thous. bush. of 56 lb	8	9	47	37	65
Rice . . . 1000 centals	3	1	6	7	17
» . . . Thous. bush. of 45 lb.	7	3	14	15	38
Exports.					
Cacao . . . 1000 lb.	0	840	3,816	13,294	20,439
Coffee . . . » »	4	148	227	1,173	1,411

*) See note page 130.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	April 10, 1942	April 1, 1942	March 27, 1942	March 20, 1942	Monthly averages: March 1942	April 1941	April 1940	April 1939	April 1938
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery May	79 1/4	79 1/4	79 1/4	79 1/4	79 1/4	76 1/8	90	61 1/4	123 3/8
„ July	80 3/8	80 3/8	80 3/8	80 3/8	80 3/8	77 3/4	91 3/8	62 1/4	112 1/4
„ October	—	—	—	—	—	—	93 1/8	63 1/4	89 3/4
Chicago (cents. p. 60 lb):									
delivery May	122 7/8	125 3/8	125 1/2	125 7/8	127 3/4	91 1/8	108	69 7/8	83 3/4
„ July	125	127 3/8	127 1/2	128	129 5/8	89 1/2	106 7/8	68 3/4	81 3/8
„ September	127	129	129 3/8	129 3/4	131 1/4	89 7/8	107	69 3/8	82
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery May	65 1/2	65 1/4	64 1/4	65	65 5/8	56 7/8	69 1/4	40 1/2	64 1/4
„ July	66 3/8	66	65 1/2	65 3/4	66 1/8	56 5/8	70 3/8	41 1/8	64 7/8
„ October	66 5/8	66 5/8	66 1/4	66 5/8	66 1/2	54 5/8	71	41 7/8	—
Chicago (cents p. 56 lb.):									
delivery May	78	79 1/4	78 3/8	77 5/8	81 1/2	47	68 1/4	41 3/4	61 1/8
„ July	80 7/8	82 1/8	81 3/8	80 5/8	84 3/8	55 1/8	69 7/8	43 1/8	59 5/8
„ September	83 1/2	84 7/8	83 7/8	83 1/8	86 5/8	56 1/4	70 7/8	44 3/8	58 1/4
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery May	64 3/4	64 3/4	64 1/2	64 1/4	64 3/8	50 7/8	52 1/2	38 1/4	57 7/8
„ July	64 1/8	63 7/8	63 1/2	63 1/8	63 1/4	47 3/8	51 1/2	37 1/8	55 1/4
„ October	62 7/8	62 3/8	62 1/2	62	61 3/4	43 7/8	50	36 3/8 *	52 5/8
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery May	51 1/2	51 1/8	51	50 7/8	51	36 5/8	38 7/8	29	47
„ July	50 5/8	49 7/8	50	49 5/8	50	35 1/8	37 3/4	28 7/8	43
„ October	49 3/4	49 1/4	49 1/4	48 7/8	49 1/4	32 3/4	36	28 5/8	38 1/8
Chicago (cents p. 32 lb.):									
delivery May	56 1/2	55 7/8	54 7/8	55	55 5/8	37 7/8	41 5/8	30 1/8	28 3/4
„ July	56 1/2	55 1/2	54 5/8	54 1/2	55 1/8	34 3/8	37 1/2	27 7/8	27 1/2
„ September	57	56	55 1/4	54 7/8	55 1/2	33 1/2	34 1/4	27 1/8	27 5/8
Maize.									
Chicago (cents p. 56 lb.):									
delivery May	88 1/8	88 3/8	87 5/8	87	87 3/4	67 1/2	61 1/4	48 1/4	60 1/8
„ July	90 1/2	90 7/8	89 7/8	89 1/4	90 1/8	68	62 1/8	49 3/4	61 3/8
„ September	92 5/8	92 7/8	91 3/4	91 1/4	91 3/4	68 1/4	63 1/4	50 3/4	62 3/8
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery May	164	164	164	164	164	161 3/8	226	156 1/2	153 5/8
„ July	164	164	164	164	164	162 7/8	228	154 5/8	154 7/8
„ October	164	164	164	164	164	157 5/8	224 3/4 *	145 7/8	—

* Indicates that the product was not quoted during part of the period under review.

APPENDIX

THE 1940 AGRICULTURAL CENSUS IN BELGIUM DATA ACCORDING TO THE SIZE OF HOLDINGS

The January-February 1942 issue of the Central Statistical Bureau of Belgium contains a study on land parcelling in that country in relation to cereal crops and livestock. This survey gives the results of the Agricultural census taken on June 15, 1940 and shows the distribution of holdings devoted to cereal crops and livestock according to the size of holdings. The publication from which the following information is drawn, contains some reservations which are required the by fact that the census was taken under particularly troubled circumstances, such as the exodus of an important part of both the rural and city population, the ruins caused by the war, the interruption of postal, telephonic, telegraphic and railroad communications. Communal administrations, however, took care to procure the declarations for those who were absent when the census was taken.

At June 15, 1940, the distribution of cereal areas in the Kingdom in relation to the size of farms, resulted as shown in the following table:

1. — *Holdings and cereal crops.*

Classification according to total area of holdings	Number of holdings reporting (1)	Total area of holdings	Area of cereal crops						
			Wheat (Winter and spring)	Spelt	Meslin	Rye	Barley (Winter and spring)	Oats	Total
			Absolute data.						
	number	acres	acres	acres	acres	acres	acres	acres	acres
Under 1 ha.	94,912	92,691	8,711	133	171	18,091	423	6,865	34,394
1 to 5 ha.	143,255	911,657	60,287	1,730	1,275	120,985	5,538	80,217	270,032
Over 5 to 10 ha.	48,538	851,115	65,326	3,899	1,485	77,086	7,401	102,180	257,377
» 10 » 20 »	24,112	828,055	81,314	5,296	1,134	45,154	12,412	103,946	249,256
» 20 » 30 »	5,919	353,564	41,302	2,622	309	10,804	8,080	45,001	108,118
» 30 » 50 »	3,004	280,990	37,884	2,264	198	5,236	8,194	35,379	89,155
» 50 » 100 »	1,661	277,637	47,183	2,234	153	3,509	11,026	38,475	102,580
» 100 ha.	286	90,929	18,390	390	27	1,399	5,100	12,150	37,456
Total	321,687	3,686,638	360,397	18,568	4,752	282,264	58,174	424,213	1,148,368
			Percentage of the total.						
	%	%	%	%	%	%	%	%	%
Under 1 ha.	29,5	2,5	2,4	0,7	3,6	6,4	0,7	1,6	3,0
1 to 5 ha.	44,6	24,7	16,7	9,3	26,8	42,9	9,5	18,9	23,5
Over 5 to 10 ha.	15,1	23,1	18,1	21,0	31,2	27,3	12,7	24,1	22,4
» 10 » 20 »	7,5	22,5	22,6	28,5	23,9	16,0	21,3	24,5	21,7
» 20 » 30 »	1,8	9,6	11,5	14,1	6,5	3,8	13,9	10,6	9,4
» 30 » 50 »	0 9	7,6	10,5	12,2	4,2	1,9	14,1	8,3	7,8
» 50 » 100 »	0,5	7,5	13,1	12,1	3,2	1,2	19,0	9,1	8,9
» 100 ha.	0,1	2,5	5,1	2,1	0,6	0,5	8,8	2,9	3,3
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

(1) Holdings reporting no cereals have been eliminated from the present table, their number however is very limited.

From the table it can be seen that the area sown to cereals is about one third of the total. This is a clear proof of the triennal system of crop rotation generally adopted in Belgium.

The fact that cereal cultures are more intensive in holdings of over 50 ha., can be explained by the use of agricultural machinery (which is more developped in large holdings), and by the more advantageous terms at which the soil of large farms yields its revenue. As regards holdings below 1 ha., the distribution of crops is done in a way that takes into lesser account the laws of crop succession and rotation. Yet the percentage of this class of holdings is very nearly normal.

The following Table shows the distribution of livestock according to the size of holdings:

2. — *Holdings and Livestock.*

Classification according to total area of holdings	Number of holdings reporting	Total area of holdings	Livestock				
			Horses	Cattle	Pigs	Milk goats	Sheep
	Absolute data.						
	number	ha.	number	number	number	number	number
Without land	5,515	—	834	2,988	4,969	2,181	5,586
Under 1 ha.	104,849	92,691	5,473	54,337	61,781	46,644	51,975
1 to 5 ha.	139,667	911,657	57,020	564,158	292,963	7,841	32,678
Over 5 to 10 ha.	48,517	851,115	55,731	487,941	234,286	1,217	18,445
» 10 » 20 »	24,098	828,055	56,846	418,382	181,154	525	16,278
» 20 » 30 »	5,939	353,564	24,230	158,093	63,720	223	6,962
» 30 » 50 »	2,985	280,990	19,686	112,051	36,927	93	6,210
» 50 » 100 »	1,649	277,637	19,677	84,620	26,595	95	8,734
» 100 ha.	291	90,929	6,102	18,676	5,994	6	5,870
Total . . .	333,510	3,686,638	245,599	1,901,246	908,389	58,825	152,738
	Percentage of the total.						
	%	%	%	%	%	%	%
Without land	1.7	—	0.3	0.1	0.5	3.7	3.6
Under 1 ha.	31.4	2.5	2.2	2.8	6.8	79.3	34.0
1 to 5 ha.	41.9	24.7	23.2	29.7	32.3	13.3	21.4
Over 5 to 10 ha.	14.5	23.1	22.7	25.7	25.8	2.1	12.1
» 10 » 20 »	7.2	22.5	23.2	22.0	19.9	0.9	10.7
» 20 » 30 »	1.8	9.6	9.9	8.3	7.0	0.4	4.6
» 30 » 50 »	0.9	7.6	8.0	5.9	4.1	0.1	4.1
» 50 » 100 »	0.5	7.5	8.0	4.5	2.9	0.2	5.7
» 100 ha.	0.1	2.5	2.5	1.0	0.7	0.01	3.8
Total . . .	100.0	100.0	100.0	100.0	100.0	100.0	100.0

As may be noticed, the number of horses, cattle and hogs is especially important in holdings of from 1 to 5 ha. Goats and sheep are to be found in larger number on small farms (— 1 ha.). On the 1 to 5 ha. category, the percentage of livestock as compared with the total, is 23 per cent. for horses, 30 for cattle, and

32 for hogs. The percentage of milch goats is about 80 per cent. on farms below 1 ha. On farms below 1 ha. sheep amount to 34 per cent. From the point of view of the general distribution of agricultural livestock, Table II shows that the largest number of horses, cattle and hogs is to be found especially on holdings from 1 to 20 ha. In fact holdings of these sizes number 69 per cent. of horses, 77 per cent. of cattle and 78 per cent. of hogs. The largest number of sheep is found on holdings from 1 to 20 ha. The "reliquat" is distributed in quite a constant manner in farms of higher categories.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country : Germany, Bohemia and Moravia (Protectorate); Hungary : 1 = *excellent,* 2 = *good,* 3 = *average,* 4 = *poor,* 5 = *very poor; Finland :* 8 = *very good,* 6 = *above the average,* 5 = *average; France :* 100 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *average,* 30 = *poor; Romania and Sweden :* 5 = *excellent,* 4 = *good,* 3 = *average,* 2 = *poor,* 1 = *very poor; Netherlands :* 90 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *below awerage; Portugal :* 100 = *excellent,* 80 = *good,* 60 = *average,* 40 = *poor,* 20 = *very poor; Switzerland :* 100 = *excellent,* 90 = *very good,* 75 = *good,* 60 = *fairly good,* 50 = *average,* 40 = *rather poor,* 30 = *poor,* 10 = *very poor; U. S. S. R. :* 5 = *good,* 4 = *above the average,* 3 = *average,* 2 = *below average,* 1 = *poor; Canada :* 100 = *crop condition promising a yield equivalent to the average yield of a long series of years; United States :* 100 = *crop condition which promises a normal yield; Egypt :* 100 = *crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed :* 100 = *crop condition which promises a yield equal to the average of the last ten years.*

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

VEGETAL PRODUCTION

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE, BARLEY AND OATS.

Spain: According to information from the principal agricultural regions, cereal crops are growing satisfactorily. Following abundant and timely rains, crops have developped well. Good yields are forecast, especially as regards winter cereals.

Greece: In some places, cool and cold weather during the second part of April and at the beginning of May has hindered the normal growth of cereal crops. It is expected however that yields will be generally good. Seeds grown in Greece have shown, during the exceptional cold of the winter, a greater resistence than imported ones. The area sown to wheat this year is 10 per cent. less than in 1941. It is hoped that good weather in May and June may help to make up for this reduction of area. An increase of area to barley, rye and oats is expected this year, as compared with 1941.

General Government: Intense snowless cold in the Fall and a hard prolonged winter did some damages to seedings in some places. Late and insufficiently cared for crops were particularly hit.

Hungary: During the three weeks March 24 to April 14, the weather was rather cold. Rainfall was above average, especially in the Southern part of the country. Plowing and sowing continued everywhere in great earnest, except in the low lands where these works were hindered by excessive wetness. Winter cereals went through the winter generally well. Crops were badly hit by excessive cold in the Spring. Winter cereals therefore are quite late, compared with the average. At the middle of April, the retard was from 2 to 3 weeks, and in some places even 4 weeks. Winter cereals that were sown early appear in better condition than those sown late. Among the latter, rye appears in worse conditions than the other winter crops. At the middle of April, sowings of Spring cereals were proceeding. In some places they were over.

Area and Production of Cereals.

Countries	Area: 1941	Area: 1940	Area: Aver. 1935 to 1939	Area: % 1941: 1940 = 100	Area: % 1941: Aver. = 100	Production: 1941	Production: 1940	Production: Aver. 1935 to 1939	Production: 1941	Production: 1940	Production: Aver. 1935 to 1939	Production: % 1941: 1940 = 100	Production: % 1941: Aver. = 100
	000 acres					000 centals			000 bushels				
Wheat													
Belgium	439	(w) 354	394	—	111.4	...	...	9,691	...	...	16,151	...	...
Denmark	203	199	316	101.8	64.1	4,189	4,094	8,617	6,981	6,823	14,361	102.3	48.6
Spain	9,445	8,735	(1)8,639	108.1	109.3	65,377	47,648	63,270	108,959	79,412	(1)105,448	137.2	103.3
Finland	331	349	264	94.8	125.3	3,426	3,939	4,208	5,710	6,565	7,013	87.0	81.4
France	...	...	12,503	...	...	165,347	94,799	171,097	275,573	157,995	285,157	174,4	96.6
Ireland	491	305	225	160.9	218.4	...	7,011	4,613	..	11,685	7,689	...	...
Italy	...	12,566	12,639	...	...	157,683	156,623	167,713	262,799	261,033	279,517	100.7	94.0
Netherlands	339	331	338	102,2	100,2	...	...	9,113	...	...	15,188	...	...
Romania	(2)5,676	(2)5,135	9,054	110,5	—	(2)43,048	(2)30,331	84,491	(2)71,745	(2)50,551	140,816	141,9	—
Slovakia	550	533	(3) 539	103.1	102.1	6,955	6,740	(3) 8,572	11,591	11,233	(3)14.287	103.2	81.1
Sweden	708	763	741	92.8	95.6	7,255	9,276	15,811	12,091	15,459	26,351	78.2	45.9
Switzerland	215	191	184	112.5	116.9	...	3,631	3,711	...	6,051	6,185	...	...
Canada	22,372	28,726	25,596	77.9	87.4	181,576	330,834	187,440	302,626	551,390	312,399	54.9	96.9
Un. St. (w)	40,316	36,147	41,186	111.5	97.9	567,540	353,491	351,467	945,900	589.151	585,778	115.8	124.1
Un. St. (s)	16,467	17,356	16,387	94.9	100.5		136,528	105,964		227,547	176,606		
Mexico	1,347	1,450	1,251	92.9	107.6	8,257	8,002	7,391	13.828	13,337	12,318	103.7	112.3
India (4)	34,499	34,003	34,485	—	—	224,400	241,562	222,396	374,000	402,603	370,660	92.9	100.9
Japan	1,983	2,024	1,738	96.1	114.1	32,377	39,682	30,078	53,960	66,135	50,130	81.6	107.6
Syria and Leb.	1,600	...	1,363	...	117.4	16,560	14,760	11,692	27,600	24,600	19,486	112.2	141.6
Algeria	...	...	4,176	...	...	19,200	16,560	20,890	32,000	27,600	34,816	115.9	91.9
Egypt	1,561	1,563	1,464	99.9	106.7	24,918	29,997	27,510	41,529	49,994	45,848	83.1	90.6
Tunisia	1,322	1,359	1,884	97.3	70.2	8,819	6,393	9,019	14.697	10,655	15,031	137.9	97.8
Argentina	(5)18,039	(5)17,569	(5)18,664	102.7	96.7	134,482	162,706	131,710	224,133	271,171	219,512	82,7	102.1
Chile	1,660	1,930	1,963	86.0	84.6	...	...	18,937	...	...	31,562	...	...
Uruguay	1,043	924	1,228	112.8	84.9	...	4,235	7,954	...	7,058	13,256	...	...
Australia	12,654	12,454	13,128	101.6	96.4	96,505	49,592	101,821	160,842	82,654	169,702	194.6	94.8
New Zealand	300	240	221	125.0	135.5	6,000	5,040	4,277	10,000	8,400	7,129	119.0	140.3
Rye													
Belgium	310	280	369	110.7	84.1	...	...	7,790	...	...	13,910	...	...
Denmark	474	339	352	139.6	134.7	6,614	5,908	5,552	11,811	10,551	9,915	111.9	119.1
Spain	1,473	1,361	(1)1,302	108.2	113.1	8,754	7,740	(1) 9,041	15,632	13,821	(1)16,144	113.1	96.8
Finland	467	459	578	101.8	80.8	5,137	4,627	7,774	9.173	8,263	13,883	111.0	66.1
Netherlands	596	563	559	105.7	106,6	...	...	11,386	...	...	20,332	...	...
Romania	(2) 217	(2) 227	1,076	95.7	—	(2) 1,649	(2) 1,168	9,597	(2) 2,945	(2) 2,087	17,137	141.1	—
Slovakia	372	368	(3) 380	101.1	97.8	4,409	4,403	(3) 5,259	7,874	7,862	(3) 9,391	100.2	83.8
Sweden	509	422	495	120.5	102.7	6,113	5,862	8,304	10.916	10,468	14,828	104.3	73.6
Switzerland	35	25	38	136.2	90.6	...	498	711	...	890	1,269	...	...
Canada	1,077	1,035	816	104,1	131.9	7,374	7,837	5,147	13,167	13,994	9,191	94.1	143.3
United States	3,436	3.192	3,723	107.6	92.3	26,019	22,737	25,576	46,462	40,601	45,672	114.4	101.7
Argentina	(5)2,661	(5)2,751	(5)2,511	96.8	106,0	3,086	4,678	5,586	5,512	8,354	9,974	66.0	55.3
Chile	19	24	30	81.7	64.4	...	...	173	...	...	309	...	...
Barley													
Belgium	74	57	76	130.4	98.0	...	...	1,757	...	...	3,661	...	...
Denmark	930	956	939	97.2	99.0	20,503	25,104	25,191	42,715	52,301	52,483	81.7	81.4
Spain	3,886	3,859	(1)3,382	100.7	114.9	37,146	30,769	31,262	77,390	64,103	65,130	120,7	118.8
Finland	326	281	305	116.0	106.9	2,910	3,061	4,070	6,063	6,377	8,478	95.1	71.5
Ireland	169	132	118	128.0	143.2	...	3,114	2,598	...	6,487	5,413	...	...
Romania	(2)1,347	(2)1,453	3,533	92.7	—	(2) 9,608	(2)10,944	22,494	(2)20,017	(2)22,800	46,863	87.8	—
Slovakia	489	497	(3) 492	98.5	99.5	5,842	6,719	(3) 6,946	12,172	13,999	(3)14,470	86,9	84.1
Sweden	244	264	252	92,6	97,0	3,514	4,173	4,777	7,322	8,694	9,952	84.2	73.6
Switzerland	44	28	12	159.0	351.0	...	511	206	...	1,066	430	...	...
Canada	5,449	4,341	4,291	125.5	127.0	56,457	50,043	42,663	117,619	104,256	88.882	112.8	132 3
United States	13,977	13,394	10,774	104.4	129.7	168,731	148,433	113,409	351,522	309,235	236,270	113.7	148.8
Japan	...	1,848	1,892	...	...	36,385	37,198	35,112	75,803	77,498	73,152	97.8	103.6

Area and Production of Cereals.

Countries	Area 1941	Area 1941	Area Aver. 1935 to 1939	% 1941: 1940 = 100	% 1941: Aver. = 100	Production 1941	Production 1940	Production Aver. 1935 to 1939	Production 1941	Production 1940	Production Aver. 1935 to 1939	= 1941: 1940 = 100	= 1941: Aver. = 100
	000 acres					000 acres			000 bushels				
Algeria	...	...	3,058	...	...	15,360	7,920	15,415	32,000	16,500	32,114	193.9	99.6
Egypt	255	268	278	95.1	95.1	4,699	5,315	7,339	9,789	11,073	15,290	88.4	64.0
Tunisia	...	...	1,174	...	...	4,400	2,000	4,564	9,186	4,134	9,508	222.2	96,6
Argentina	(5)1,972	(5)2,139	(5)1,903	92.2	103.6	8,157	17,395	11,329	16.994	36,239	23,602	46.9	72.0
Chile	128	128	184	99.9	69.5	...	...	2,419	...	...	5,041	...	...
Uruguay	67	54	(6) 36	122.7	—	...	216	(6) 259	...	450	(6) 539	...	...
New Zealand	30	26	24	115.4	125.5	550	481	461	1,146	1,002	961	114.4	119.2
OATS													
Belgium	413	...	548	...	75.4	...	...	14,074	...	...	43,982	...	...
Denmark	846	843	926	100.3	91.4	16,314	19,641	22,303	50,982	61,378	69,697	83.1	73.1
Spain	1,646	1,597	(1)1,423	103.1	115.7	12,469	10,459	(1)10,549	38,964	32,685	(1)32,966	119.2	118.2
Finland	1,055	1,054	1,142	100.1	92.4	10,626	11,128	15,974	33,207	34,776	49,917	95.5	66.5
Ireland	779	681	571	114.4	136.5	...	16,222	12,565	...	50,694	39,265	...	...
Romania	(2)1,134	(2)1,070	1,792	106.0	—	(2) 9,121	(2) 8,173	12,803	(2) 28,502	(2) 25,539	40,009	111.6	—
Slovakia	370	365	(3) 333	101.5	131.3	...	4,596	(3) 3,660	...	14,363	(3) 11,437	...	...
Sweden	1,553	1,569	1,641	99.0	94.7	17,139	20,660	27,904	53,459	64,563	87,199	83.0	61.4
Switzerland	80	53	28	150.2	286.3	...	1,140	510	...	3,562	1,593	...	...
Canada	13,841	12,298	13,246	112.6	104.5	120,138	129,379	114,94	375,430	404,309	359,201	92.9	104.5
United States	37,236	34,847	35,417	106.9	105.1	364,430	395,401	329,369	1,138,843	1,235,628	1,029,279	92.2	110.6
Algeria	...	...	470	...	...	2,560	...	3,387	8,000	...	10,585	...	75.6
Argentina	(5)3,519	(5)3,899	(5)3,567	90.2	98.6	9,921	11,894	16,254	31,002	37,168	50,795	83.4	61.0
Chile	168	198	279	85.3	60.3	...	...	2,455	...	...	7,670	...	...
Uruguay	237	225	213	105,5	111.2	...	421	992	...	1,316	3,100	...	...
New Zealand	60	61	63	98.4	95.4	1.080	1,120	1,174	3,375	3,500	3,669	96.4	92.0

(*w*) Winter crop. — (*s*) Spring crop. — (1) Year 1939. — (2) Not including territories transferred in 1940. — (3) Average of two years — (4) Final estimate except for 1941 area, the figure of which is that of the fourth estimate. — (5) Area sown. — (6) Not including barley for brewery.

Complaints are heard about the excess of humidity in the low lands. Spring cereal seedings done early have shot regularly but crops need warmer weather. During the 3 successive weeks from April 14 to May 4, the weather continued exceptionally cool. This had an unfavourable effect on the development of cereals. Towards May 4, the different cereal crops were thin, low and late. Here and there wheat sowings had began to turn yellow on account of too much rain and cold. Spring cereals have shot generally well: warmer weather was needed for a normal growth of all kinds and varieties of cereals.

Romania: During the month of April, the weather continued cold and rainy. Consequently, sowings of Spring cereals were badly hindered. Farmers were obliged to take advantage of even the slightest intervals of dry weather to continue sowings. Although sowings are from three to four weeks late, it is hoped that they may be over within the proper time. At the beginning of May it could be noticed that winter cereals had hibernated well and were developping normally.

Owing to the delay in the sowings of the most important cereals on account of cold and rainy weather, it is foreseen that a larger area will be sown to millet for human consumption. Responsible authorities have gathered the necessary quantities of seeds to meet the eventual demand of farmers.

Switzerland: In the last few weeks the weather was quite fresh and the north wind having dried the soil, has hindered the growth of crops. Temperature remained equally fresh during the first days in May; mornings were extremely cold, and sunrise was accompanied by currents of cold air, so that the thermometer never went above freezing temperature and sometimes it went even below. During these last weeks, Spring works went on well, favoured by dry weather, so that the retard of the beginning of the season has been made up to a great extent. Spring sowings had been done under good conditions, but germination and growth of the vegetation were hindered by too dry and fresh weather. Autumn cereals also suffered from cold and drought. Persistent north winds have been particularly damaging to shoots. Crops, instead of growing, weakened and in many places had to be upturned. Fields of Autumn rye and barley which had already suffered heavily from the cold of the winter, could no further grow. Winter wheat, which at the beginning of April appeared in fine condition, has been badly hit by the north wind and drought. In many places, sowings were damaged by larvae of bugs and worms.

The following table is showing the condition of the various crops, expressed in the form of index-numbers (basis a very good crop made equal to 100):

	May 1, 1942	April 1, 1942	May 1, 1941
Autumn Wheat	70	80	77
Spring Wheat	74	—	76
Autumn Rye	62	62	78
Spring Rye	74	—	77
Autumn Barley	67	70	78
Spring Barley	76	—	78
Oats	76	—	78
Meslin	73	78	78
Spelt	76	80	80

Ukraine: Together with other information relative to winter and spring sowings in Ukraine, it has lately appeared in the press a statement of the Central Agricultural Bureau of Kiev which, while showing that the acreage sown to winter cereals in the Fall of 1941 represents about half the area normally left to these crops, made it known that it was the intention of responsible authorities to increase spring sowings. The spring program in fact foresaw the sowing of 3,546,000 acres to wheat (against 1,445,600 acres in 1941), 3,276,700 acres to barley, 1,976,900 acres to millet, 474,400 acres to buckwheat and 296,500 acres to maize.

In order to make these figures better understandable, we reproduce the data relative to cereal crops in Ukraine in 1938, which is the most recent year for which we possess official statistical information. These data refer to Ukraine within its boundaries at that time, that is, without Galicia, Northern Bukovina and Bessarabia: all regions that were part of Ukraine in 1940 and 1941.

In the tables containing these data, the single regions of Ukraine are grouped in the three following zones:

(1) the occupied zone to which are probably referring the data of the Kiev Central Agricultural Bureau (regions of Dniepropetrovsk, Jitomir, Zaporoje, Kamenets-Podolsk, Kiev, Kirovograd, Poltava, Cernigov and Vinnitza);

(2) the occupied zone under Romanian administration (regions of Moldavia, Nikolaiev and Odessa);

(3) and the zone in which war operations are still going on, or which is beyond the line of these operations (regions of Kharkov, Stalino, Soumy and Voroshilovgrad. It is evident that the reference to the boundaries of these zones, based on the admini-

strative subdivision of the year 1938, gives only an approximate idea of the real situation at present.

It is possible that in 1938 the area to cereals was not much different from that of the year 1941, considering that war operations started on June 22, and therefore the sowing program last year could be carried out almost normally.

The place held by cereal crops in Ukraine is indicated by the data in the following table, showing the acreage subdivision to winter and spring cereals, to cereals as a whole, and finally to all the other crops (industrial, food and forage plants).

To be exact, it must be mentioned that, in the group of spring cereals figure also grain leguminous plants, which however are not very important and do not substantially alter the situation of the other single large groups of crops registered in the table.

Subdivision of sown acreage in Ukraine in 1938.

(Thousand acres)

Regions	Winter cereals	Spring cereals	Cereals (total)	Other crops	Total area sown
Dniepropetrovsk	2,054.2	1,428.8	3,483.0	1,255.3	4,738.3
Jitomir	1,037.6	1,032.2	2,070.8	965.0	3,035.8
Zaporoje	2,441.4	1,479,4	3,920.8	1,445.8	5,366.6
Kamenets-Podolsk . . .	1,094.7	1,105.1	2,200.0	1,097.2	3,297.2
Kiev	1,760.7	1,766.1	3,526.8	1,663.5	5,190.3
Kirovograd	1,570.1	1,074.7	2,644.8	1,089.0	3,733.8
Poltava	1,910.9	1,641.5	3,552.4	1,558.8	5,111.2
Cernigov	1,144.4	1,281.3	2,425.7	1,138.9	3,564.6
Vinnitsa.	1,479.2	1,525.9	3,005.1	1,524.9	4,530.0
Total . . .	*14,493,2*	*12,336,0*	*26,829.2*	*11,738.4*	*38,567.6*
Moldavia	498.4	397.6	896.0	363.7	1,259.7
Nikolaiev	2,035.7	1,063.3	3,099.0	1,268.7	4,367.7
Odessa	1,764.1	1,259.3	3,023.4	1,098.4	4,121.8
Total . . .	*4,298.2*	*2,720.2*	*7,018.4*	*2,730.8*	*9.749.2*
Kharkov	1,584.7	1,439.4	3,024.1	1,440.2	4,464.3
Stalino	1,103.3	1,329.7	2,433.0	1,358.4	3,791.4
Soumy	1,115.0	1,181.7	2,296.7	1,128.3	3,425.0
Voroshilovgrad	1,027.5	1,274.1	2,301.6	963.0	3,264.6
Total . . .	*4,830.5*	*5,224.9*	*10,055.4*	*4,889.9*	*14,945.3*
GENERAL TOTAL . . .	**23,621.9**	**20,281.1**	**43,903.0**	**19,359.1**	**63,262.1**

Taking Ukraine as a whole, in 1938 cereals filled 43,903,000 acres, i. e., 69.4 per cent. of sown area; winter cereals prevailed over spring crops (respectively, 54 and 46 per cent.). In the first zone, that is, the zone to which are probably referring the data published by the Central Agricultural Bureau of Kiev, acreage to cereals amounted to 26,829,200 acres, or 60.6 per cent. of the area to cereals all over Ukraine, and included 14,493,200 acres to winter and 12,336,000 acres to spring cereals. Consequently, the area sown to winter cereals last fall in the first zone, should amont to about 7,400,000 acres. In the second zone, (since under Romanian administration), the area to cereals was 7,018,400 acres (i. e., 14.1 per cent. compared with the whole of Ukraine), with an even greater preheminence of winter cereals (4,298,200 acre against 2,720,000 acres to spring cereals). Finally, in the third zone, cereals covered 10,055,400 acres (25.3 per cent. compared with the whole of Ukraine), with a slight prevalence of spring cereals (5,224,900 against 4,830,500 acres). It must be added that the prevalence of winter on spring cereals in Ukraine, taken as a whole, is the

result of a long systematic activity based on an ever increasing extension of winter wheat, which under local climatic conditions, is the safest and most profitable crop, at the expense of spring wheat, which is a less safe crop on account of summer drought prevailing in many zones, especially in the steppe regions. While in 1913 the area to winter wheat amounted to 5,496,400 acres, in 1938 it had reached 15,960,000 acres. Spring wheat acreage on the contrary, from 13,813,900 acres, decreased to 2,486,200 acres. If one considers also that the acreage to winter rye (spring rye is not grown in Ukraine) has decreased but slightly, compared with 1913, the whole of the area sown to bread-making cereals (wheat and rye) only fell from 28,440,300 acres in 1913 to 26,108,100 acres in 1938. The biggest decrease has been registered by the acreage to spring cereals (36,522,300 acres in 1913 and 20,281,100 in 1938), and this decrease is accounted for not only by a reduction of area to spring wheat, but also by the reduction of the barley (barley in Ukraine is exclusively a spring crop) and oats acreages (from 17,853,400 to 10,916,800 acres for both barley and oats taken together). The acreage to maize, on the contrary, has increased. Notwithstanding this, however, the total acreage to winter and spring cereals fell from 51,177,015 acres in 1913 to 43,903,000 acres in 1938, in spite of the remarkable increase of the total sown area, which, from 56,572,100 acres in 1913 went up to 63,262,100 in 1938. The reduction of total acreage to cereals was accompanied by an increase of the area sown to all the other crops (industrial, forage, etc., plants), which, from 5,395,100 grew to 19,359,000 acres.

After this brief survey on the importance of cereal crops in Ukraine compared with all the other cultures, in the following table is indicated the subdivision of areas to each single cereal in the different regions grouped in the three zones mentioned above.

Subdivision of total acreage to cereals in Ukraine in 1938.
(thousand acres).

Regions	Winter rye	Winter wheat	Spring wheat	Spring barley	Oats	Maize	Millet	Buck-wheat
Dniepropetrovsk	421.8	1,632.4	300.2	495.7	153.2	395.9	53.4	0.7
Jitomir	708.2	329.4	11.4	261.2	354.6	0.2	62.0	275.3
Zaporoje	172.7	2.268.7	142.3	819.2	170.8	243.2	73.4	—
Kamenets-Podolsk	511.8	582.9	1.2	312.6	305.7	108.7	41.3	123.1
Kiev	829.1	931.6	6.4	518.9	518.9	25.5	155.2	263.4
Kirovograd	333.1	1.237.0	107.7	452.0	170.8	183.3	72.4	26.4
Poltava	915.5	995.4	272.2	448.7	322.2	211.0	91.9	152.2
Cernigov	980.5	163.8	42.0	234.8	395.6	2.5	55.6	357.1
Vinnitsa	531.0	948.2	0.5	488.0	418.8	150.0	55.6	133.2
Total	*5,403.7*	*9,089.4*	*883.9*	*4,031.1*	*2,810.6*	*1,320.3*	*660.8*	*1,331.4*
Moldavia	67.2	431.2	20.8	131.5	27.4	198.2	7.9	—
Nikolaiev	136.7	1,899.0	71.2	682.3	90.4	126.8	58.8	—
Odessa	155.7	1,608.4	98.3	630.6	123.6	313.8	61.8	4.2
Total	*359.6*	*3,938.6*	*190.3*	*1,444.4*	*241.4*	*638.8*	*128.5*	*4.2*
Kharkov	720.3	864.4	362.8	409.0	257.7	175.0	98.6	38.3
Stalino	205.6	897.8	456.1	419.8	181.6	193.5	37.6	3.2
Soumy	724.0	390.9	138.4	223.4	328.2	8.4	68.4	263.2
Vorochilovgrad	292.6	734.9	454.7	394.4	175.2	172.7	40.0	9.1
Total	*1.942.5*	*2,888.0*	*1,412.0*	*1,446.6*	*942.7*	*549.6*	*246.6*	*313.8*
General total	**7,705.8**	**15,916.0**	**2,486.2**	**6,922.1**	**3,994.7**	**2,508.7**	**1,033.0**	**1,649.4**

No information is available regarding areas sown last Fall to rye and winter wheat respectively. As mentioned above, all that is known about this matter is that the total acreage to winter crops has decreased. As regards spring wheat, the acreage that according to the plan was to have been sown to that crop ove the first zone (to which are presumably referring the data published by the Kiev Central Agricultural Bureau) was expected to amount to 3,546,000 acres. This figure is by far greater than that of the acreage sown in 1938 in the whole of Ukraine (2,486,200 acres), of which over one half (1,412,000 acres) were in the free zone, while only 883,900 acres sown to barley were in the first zone.

The area which according to the plan, was to be sown in the first zone this year, amounted to 3,276,700, against 4,031,100 acres in 1938. This acreage represented about 6/10 of the area to this crop in Ukraine. As regards oats which in 1938 occupied 2,810,600 acres in the first zone, no information is available concerning the plan of the Kiev Central Agricultural Bureau.

The area of the plan for maize is represented by 296,500 acres, against 1,320,300 in 1938. If this figure is correct, it probably reflects the grave difficulties which this year hinder the culture of weeded plants which require very deep plowing, great cultural cares and the employment of agricultural machinery.

Lastly, in the plan for 1942 figure the data for buckwheat and millet: 474,400 and 1,976,900 acres respectively. The acreage to buckwheat in Ukraine has remained sufficiently stable these last years. This crop was concentrated mainly in the first zone. The figure of the plan is very much lower than that of 1938 (1,331,400 acres). As for millet the acreage foreseen (1,976,900 acres) is almost twice the size of the area sown all over Ukraine in the same year 1938 (1,033,900 acres), and trice that sown, in 1938 also, in the first zone (660,800 acres). The maximum acreage to millet was registered in 1934, when climatic conditions in the spring were about the same as those prevailing this year. In the following years, however, the culture declined as if of secondary importance and merely complementary, which should be attended to only in the case of an abnormal spring season.

By summing up at this point the acreages to spring crops (wheat, barley, buckwheat, millet and maize) foreseen by the plan, we get a total of 9,570,500 acres, against 8,227,500 sown in the first zone in 1938.

No information is available regarding the conditions of winter crops. It is only known that winter was exceptionally rigid; but data on the density of the snow blanket, on the effects of snow melting during the winter, etc., are utterly lacking.

It is known that this year the spring season started quite late, thus considerably shortening the period of time needed for plowing and timely sowings. These factors, owing to climatic conditions in Ukraine, have a great influence on the results of harvests, especially of spring straw cereals. To this scanty information, may be added that the wholesale destruction of agricultural machinery, the abandonment last year of some crops in the fields which caused the self-sowing of cereals and the excessive development of damaging weeds, the dearth of draft animals and labour – all these circumstances together – complicated the situation of cereal crops in Ukraine, especially as compared to conditions in normal times during these last years, when the great development of mechanized agriculture protected agricultural production against a great many aleatory factors.

U. R. S. S.: According to press news, the Government has laid the greatest emphasis on the increase of the sown acreage to make up for the loss of grain crops of the occupied territory. It is expected that the main expansion of the sown area takes place in Eastern and Western Siberia, the Ural, the Volga regions and Kazakstan, where

the local Agricultural Commissariats have fixed additional acreage to be sown by collective and state farms. During recent years these provinces had already considerably developed their cereal cultivation.

The sowings start under extremely difficult conditions. While Russian agriculture is nowadays entirely dependent on the efficient work of its motorised equipment, hundreds of thousands of tractor and lorry drivers have joned the tank divisions of the Army. Repair of tractors is another difficulty, as the technical staff of the Machine tractor Stations workshops have also been depleted by the call to the colours. The shortage of agricultural labour unskilled as well as skilled is acute. In many regions the labour shortage has threatened to cause a fall in the sown acreage instead of the required increase. To counter this threat, a decree has been issued for tilling the land of neighbouring farms unable to carry out the work for lack of labour hands.

Argentina: April drought has hindered plowing for cereal sowings.

According to a telegram by the Argentine Ministry of Agriculture dated May 29, weather conditions prevailing in May, have not been favourable to cereal sowings.

Transjordan: A good cereal crop is forecast. It is hoped that wheat production will amount to 4,400,000 centals (7,350,000 bushels), and that barley will yield 2,200,000 centals (4,600,000 bushels).

MAIZE WORLD-AREA AND PRODUCTION IN 1941-42 (1)

by V. DESMIREANU

I. — General remarks.

At the time of maize harvesting in the Southern Hemisphere, it is possible, after the first official estimate of Argentine production, to make a provisional balance of the maize situation in the world. This year, owing to the war that has spread all over the globe, statistical and other information is quite scarce for most countries. Yet data on production in the United States, in Argentina and in some important European producing countries give us the possibility of drawing, at least on general lines, an approximate picture of the characteristics of the 1941-42 maize season.

At the beginning of the season, that is in March-April 1941, the following factors could have especially influenced the farmers of the Northern hemisphere in their plans of maize sowings:

(1) Argentina was about to harvest a very abundant crop (403 million bushels), which followed the exceptionally big one (408 million bushels) of 1940. As the heavy exportable surplus of Argentine maize could not be exported to Europe on account of the war, it did not have any influence on the plans of European farmers; but, on the other hand, it increased the tendency towards a reduction of maize production in the United States, where the Government had encouraged it since 1936.

(1) We are dealing here with the maize harvested chiefly in October 1941 in the Northern Hemisphere and in March and April 1942 in the Southern Hemisphere.

(2) The war hit the very important maize producing region of former Yugoslavia, where the new administrations inaugurated new agricultural policies.

(3) In continental Europe, the use of maize as human food becomes general, and maize flour is often employed as an integral part of bread up to a maximum percentage allowed by the technique of breadmaking.

(4) Owing to the lack of tonnage and to sea-going risks, maize exports from other production centers, and particularly from Indochina, the Netherlands Indies and the Union of South Africa, have completely ceased.

Thus the world, on account of the war, finds itself divided into several sections which cannot communicate between each other. Urgent needs of each section impose a new agricultural policy, especially in regard to the production of cereals for human alimentation and animal feeding.

II. — Maize acreage in the world.

As has been remarked above, in the United States the conjuncture of the maize world market in March-April 1941 induced the farmers not only not to increase, but rather to further reduce areas sown to maize, which in fact amounted to 87.7 million acres in 1941, against 88.1 million acres in 1940, 91.1 millions

I. — *United States maize crop.*

YEAR	Area				Production	Yield: bushels per acre	
	Planted	Harvested (1)	Area lost	% of area lost, Planted = 100		of planted area	of harvested area
	1,000 acres	1,000 acres	1,000 acres	%	1,000 bushels	bushels	bushels
% of 1941:							
1940 = 100	99.4	99.4	101.1	—	109.2	—	—
1939 = 100	96.2	97.2	63.5	—	102.8	—	—
Average 1934/38 = 100	89.7	92.0	39.5	—	127.6	—	—
1941	87,656	85,943	1,713	2.0	2,675,373	30.5	31.1
1940	88,143	86,449	1,694	1.9	2,449,200	27.8	28.3
1939	91,128	88,430	2,698	3.0	2,602,133	28.6	29.4
Average 1934/38	*97,762*	*93,428*	*4,334*	*4.4*	*2,097,088*	*21.5*	*22.4*
1938	93,689	92,222	1,467	1.6	2,562,197	27.3	27.8
1937	96,342	93,741	2,601	2.7	2,651,284	27.5	28.3
1936	100,599	93,020	7,579	7.5	1,507,089	15.0	16.2
1935	98,372	95,804	2,568	2.6	2,303,747	23.4	24.0
1934	99,806	92,354	7,452	7.5	1,461,123	14.6	15.8
Average 1929/33	*105,754*	*104,544*	*1,210*	*1.1*	*2,501,595*	*23.7*	*23.9*
1933	108,527	105,963	2,564	2.4	2,399,632	22.1	22.6
1932	112,061	110,577	1,484	1.3	2,931,281	26.2	26.5
1931	108,469	106,912	1,557	1.4	2,575,611	23.7	24.1
1930	101,813	101,465	348	0.3	2,080,421	20.4	20.5
1929	97,898	97,805	93	0.1	2,521,032	25.8	25.8
Average 1924/28	*100,162*	*99,979*	*183*	*0.2*	*2,570,020*	*25.7*	*25.7*
1928	100,399	100,336	63	0.1	2,665,516	26.5	26.6
1927	98,460	98,357	103	0.1	2,616,120	26.6	26.6
1926	99,660	99,452	208	0.2	2 546,972	25.6	25.6
1925	101,413	101,331	82	0.1	2,798,367	27.6	27.6
1924	100,879	100,420	459	0.5	2,223,123	22.0	22.1

(1) Includes acreage for grain, for silage, hogged down, grazed and used for forage in general.

in 1939, and an average of 97.8 millions in the five years 1934-38. The maize acreage in the United States in the year 1941 was the smallest in the last 47 years.

In the course of the last 18 years figuring in Table I, the maximum area sown to maize in the United States was registered in 1932 with 112.1 million acres. Thus during the last ten years, there has been a reduction of about 24 million acres.

The series of harvested areas follows an entirely parallel line, owing to the fact that abandoned areas represent, as a general rule, a small percentage of sown areas. Only the exceptionally heavy losses caused by drought in 1934 and 1936 (respectively 7.5 and 7.6 million acres) hit 7.5 per cent. of the sown area. It seems interesting to note that during the first half of the period under consideration in the Table (1924-1932) area lost kept at a very low level, never going beyond 1.4 per cent. of the sown acreage, while during the second half they appear considerably higher, even if the exceptional years 1934 and 1936 are left aside.

The relative importance of the maize crop of the United States in the Northern hemisphere is so great that acreage changes in that country shape the direction and the amount of variations of areas sown to maize all over the northern hemisphere.

Among the other important maize producing countries of the Northern hemisphere, only Romania has recently published some statistical data on maize production in 1941. According to these statistics which refer to the Romanian territory after all the territorial cessions of 1940 (therefore without Bessarabia and Northern Bukovina), the area sown to this crop in 1941 amounted to 8.2 millions acres against 8.8 millions in 1940 and 8.5 million acres in 1939 (same territory), *i. e.*, 92.9 and 96.0 per cent. respectively as compared with the years 1940 and 1939. The plan for crop reorganisation prepared by the Romanian Government after the territorial cessions, foresaw a reduction of area sown to maize in zones which had proved unadequate to yield a good crop. In these zones, maize was to be replaced mostly by potatoes. The recovery of Bessarabia – a great producer of maize – and of Northern Bukovina by Romania, modified once more the proportions between maize and the other crops in that country. The principle of a reduction of maize production in regions that have proved unfavourable to it, will be upheld with a view to increasing the productivity of these regions and of the whole country.

As mentioned a bove, in 1941 great territorial changes took place in the important maize producing region of former Yugoslavia. Considering that in these regions maize is cultivated for three purposes, *i. e.*, pig fattening, human feeding and even exportation, after the establishment of the new administrations, there will probably occur no great modifications in the culture of maize. As regards Hungary, it may be interesting to remark that, after the incorporation of the rich maize producing territories that belonged formerly to Yugoslavia, Hungary's maize supply, which had become scarce after the incorporation of Subcarpathia and Northern Transylvania, (two relatively poor maize producing regions) has again become quite good.

After the entrance of the U. S. S. R. into the war, important maize producing regions which belonged to that country, fell under German and Roma-

nian administration, so that their crops became available for consumption of continental Europe. In Table II have been gathered the statistical data showing the distribution of maize production in the U. S. S. R.

II. — *Geographical distribution of the maize culture in the U. S. S. R. in the years 1934-1938.*

Provinces	Average 1934-1938 of the maize area — Thousand acres	Percentages
Ukraine	2,793.3	36.5
including:		
Vinitsa	176.4	2.3
Voroshilovgrad	187.8	2.5
Dniepropetrovsk	438.6	5.7
Jitomir	0.5	0.0
Zaporoje	296.5	3.9
Kamenets-Podolsk	106.0	1.4
Kiev	39.5	0.5
Kirovograd	192.5	2.5
Nikolaiev	176.9	2.3
Odessa	334.8	4.4
Poltava	213.5	2.8
Stalino	224.1	2.9
Soumy	9.6	0.1
Kharkov	173.7	2.3
Cernigov.	2.0	0.0
Moldavia	220.9	2.9
Crimea	158.6	2.1
Voronesh	133.7	1.7
Rostov	575.8	7.5
North. Caucasia	2,670.2	34.9
Transcaucasia	998.1	13.0
Other regions	324.7	4.3
Total U. S. S. R.	7,654.4	100.0

Table II shows that most of the maize crop is produced in Ukraina and Northern Caucasus, where during the period 1934/1938 were sown to maize 36.5 and 34.9 per cent. respectively of the total maize area of the Union. These two provinces are followed, in order of relative importance, by Transcaucasia (13.0 per cent.) and Rostov (7.5 per cent.). In Ukraine itself, the provinces of Dniepropetrovsk and Odessa are the greatest maize producing centers. The provinces of Odessa and Moldavia, now under Romanian administration, grow to maize 7.3 per cent. of the whole maize producing area of the U. S. S. R. During the last ten years the raising of this crop in the Union has shown a constant tendency to decrease: the acreage fell from 9.9 million acres in 1931 to 5.3 million acres in 1940.

Canada also appears among the countries of the Northern hemisphere for which statistical data are available. In 1941 this country registered an increase of the maize culture of 61.3 and 74.2 per cent. respectively as compared with

1940 and the average from 1935 to 1939. This increase may be put in relation to the considerable reduction of Spring wheat in 1941. In fact, while formerly the province of Ontario alone produced all the maize for seeds, in 1941 over 1/3 of the crop was grown in Manitoba.

Taking into account all the available statistical data on the acreage sown to maize, data on production if those on area are lacking (as is the case for Italy and Spain), and other supplementary information, the total acreage sown to maize in 1941 in the Nortern hemisphere (not including China and the U. S. S. R.) may be estimated at 149.8 million acres against 151.5 millions in 1940 and 153.9 million acres on the average of the years 1935/1939; percentages: 98.9 and 97.3 respectively. Area reduction in the whole Northern hemisphere is slower than in the United States (see Tables I and IV), owing to the fact that there are countries where maize production remains nearly stationary, and other countries where, as is the case of Manchukuo, it has a tendency to increase considerably.

As regards the Southern hemisphere, the changes of acreage sown to maize are essentially determined by the extent of sowings in Argentina. This country, which ordinarily exported 80 per cent. of its maize production, feels the effects of the situation of the world market more deeply than the other countries, where the product was mostly consumed in the country itself, (Brazil, for instance) and acreages are quite stable.

The export difficulties of Argentine maize have been growing during the years 1939/41 as a consequence of the war. The process of the reduction of area sown to maize started in that country. In fact, while at the time of the beginning of the war in Europe (September 1939) Argentine farmers had sown to maize 17.8 million acres, two years later (September-October 1941) they had only sown about 12.3 millions acres, a reduction of 30.6 per cent. The area sown in September-October 1940 had been 15.1 million acres.

Each year of the war has seen a reduction of acreage to maize amounting to about 1.8 millions acres.

So far no figures are available regarding the harvested area, which as a rule is considerably different from area sown. While the first depends chiefly on the conjuncture of the world maize market, the latter reflects also the influence of weather onditions on vegetation. While comparing sown with harvested areas in Argentina, one must carefully consider the meaning of the words « lost acreage » (see note at Table III), which mean not only areas on which maize has been destroyed by drought or bad weather, but also areas on which maize has been grazed. « Lost » area has shown a strong tendency to increase these last twenty years, partly as a consequence of the great spread of this crop over soil not well suited to its cultivation.

Taking in account the sown area and the unit yield in relation to it (29.4 bushels per acre) we have estimated the harvested area in Argentina at 10.4 millions acres.

On the basis of available statistical data and of other complementary information, the area sown to maize this year in the Southern hemisphere amounted to 39.0 millions acres against 40.8 millions in 1941 and 38.3 million acres as an

III. — *Argentina maize crop.*

Years	Area				Production	Yield: bushels per acre	
	Planted	Harvested	Area lost (1)	% of area lost, Planted = 100		of planted area	of harvested area
	1,000 acres	1,000 acres	1,000 acres	%	1,000 bushels	bushels	bushels
% of 1941/42:							
1940/41 = 100	82.0	...	...	—	89.9	—	—
1939/40 = 100	69.4	...	...	—	88.7	—	—
Average 1934/35-1938/39 = 100	77.5	...	...	—	116.6	—	—
1941/42	12,300	...	...	...	362,190	29.4	...
1940/41	15.068	12,155	2,913	19.3	403,055	26.7	34.0
1939/40	17,792	14,073	3,719	20.9	408,448	23.0	29.0
Average 1934/35-1938/39	*15,938*	*10,704*	*5,234*	*32.8*	*310,692*	*19.5*	*29.0*
1938/39	13,097	8,654	4,443	33.9	191,488	14.6	22.1
1937/38	15,319	7,308	8,011	52.3	174,166	11.4	23.8
1936/37	15.052	10.777	4,275	28.4	340,153	22.6	31.6
1935/36	18,854	12,689	6,165	32.7	395,701	21.0	31.2
1934/35	17,369	14,091	3,278	18.9	451,950	26.0	32.1
Average 1929/30-1933/34	*14,567*	*10,212*	*4,355*	*29.9*	*304,861*	*25.9*	*29.9*
1933/34	16,097	10,161	5,936	36.9	256,917	16.0	25.3
1932/33	14,540	9,374	5,166	35.5	267,765	18.4	28.6
1931/32	14,468	9,518	4,950	34.2	299,334	20.7	31.4
1930/31	13,776	11,578	2,198	16.0	419,668	30.5	36.2
1929/30	13,955	10,428	3,527	25.3	280,621	20.1	26.9
Average 1924/25-1928/29	*10,590*	*8,678*	*1,912*	*18.1*	*278,562*	*26.3*	*32.1*
1928/29	11,832	8,694	3,138	26.5	252,412	21.3	29.0
1927/28	10,739	8,803	1,936	18.0	311,602	29.0	35.4
1926/27	10,599	9,061	1,538	14.5	320,853	30.3	35.4
1925/26	10,618	9,635	983	9.3	321,641	30.3	33.4
1924/25	9,162	7,195	1,967	21.5	186,301	20.3	25.9

(1) Area the output of which has been destroyed, and acreage grazed off.

average for the years 1935/36 to 1939/40; percentages: 95.8 and 101.9 respectively. For a correct interpretation of the figures, it must be remembered that we are dealing with harvested and not sown areas. The figure showing the average is comparatively small beacuse it includes the extremely small harvested area of Argentina in 1937/38 and the equally small harvested area of the Union of South Africa in 1935/36. Thus it is found that the maize harvested area in the Southern hemisphere in 1941/42, though smaller as compared with the two preceding years, is almost the same as the average of the years 1935/36 to 1939/40.

Table IV contains the data referring to both hemispheres, putting special stress on the relative importance of the two most important maize producing countries, the United States and Argentina. The area to maize over the whole world not including China and the U. S. S. R, can be estimated at 188.8 million acres in 1941 (1941/42) against 192.3 millions in 1940 (1940/41) and an average of 192.3 in the five preceding years; percentages: 98.2 and 98.2. As a result of the two opposite tendencies in the two hemispheres, the 1940/41 area results exactly equal to the average; the total of the harvested areas of the United

IV. — *Maize area in the World by hemispheres.*

(Million acres)

Hemispheres		1941 (1941/42)	1940 (1940/41)	Average 1935-1939 (1935/36-1939/40)	% of 1941 (1941/42): 1940 (1940/41) = 100	% of 1941 (1941/42): Average = 100
North. Hemisphere (1)	(2)	149.8	151.5	153.9	98.9	97.3
including United States		(85.9)	(86.4)	(92.6)	(99.4)	(92.8)
South. Hemisphere	(2)	39.0	40.8	38.3	95.8	101.9
including Argentina	(2)	(10.4)	(12.2)	(10.7)	(85.4)	(97.0)
World total (1)	(2)	*188.8*	*192.3*	*192.3*	*98.2*	*98.2*
including United States et Argentina	(2)	(96.3)	(98.6)	(103.3)	(97.7)	(93.2)

(1) Less the Soviet Union and China. — (2) Estimate.

States and Argentina, on the contrary, show a net decrease in 1940/41 as compared with the average. The figures of 1941/42 are lower than those of the year before, both as regards the whole world and the total of the United States and Argentina.

III. — Weather conditions and yields.

Weather conditions in the United States were very favourable to the growth of maize in its initial stage (May-June 1941). In July very beneficial rains alternated with warm weather, so that during the last week of July, when the crop was at its critical stage, its condition varied from good to excellent. In the first two weeks in August, the weather was less favourable, but it became better in the second half of the month and during September the crop made rapid progress, quickly reaching the ripening stage thanks to warm weather. Frost in the last week in September could not have damaged the seeds.

Seasonal conditions and their influence on yields are summarised in the following Table which shows the variations of official estimates at the first day of each month, on the basis of the crop condition.

V. — *United States. – Variations of the official forecasts of maize production during July to December 1940 and 1941.*

Date of the report	Million bushels of 56 lb. each: 1941	1940
1 July	2,549	2,416
1 August	2,588	2,248
1 September	2,524	2,297
1 October	2,626	2,352
1 November	2,675	2,434
1 December	...	2,449

In 1941, unit yields in the United States were exceptionally high: per acre of area sown and per acre of area harvested (see Table 1). This is the highest yield since 1906.

The weather was very favourable in Canada too, as is shown by high yields, although the acreage to maize has been considerably increased.

In Romania, sowings were done early, but owing to cold and rainy weather, germination was defective. Summer also was rather cold and rainy. Ripening was late, especially in Moldavia. As a rule the crop showed a high degree of humidity. In order to help the rationalisation of the maize culture, and also to improve yields that were too low, the Government organised in 1941 the first maize competition which obtained good results.

In Hungary too the sowing of maize was started rather early, but in several regions germination was irregular. The month of July was favourable to the crop. Yet ripening was irregular, particularly in the Northern and Eastern parts of the country where violent winds caused additional damages to the crop.

VI. — *Yield of maize.*

(Bushels of 56 lb. per acre harvested)

Hemispheres and Countries	1941 (1941/42)	1940 (1940/41)	Average 1935-1939 (1935/36-1939/40)
Northern Hemisphere	*26.2*	*24.6*	*22.8*
United-States	31.1	28.3	25.1
Canada	39.5	37.4	40.7
Romania	(1) 15.9	(1) 16.7	(2) 16.8
Southern Hemisphere	(3) *21.2*	*21.4*	*19.8*
Argentina	(3) 34.9	33.2	28.2
World total excluding China and the U. S. S. R.	(3) 25.2	23.9	22.2

(1) Area remaining ofter all the territorial cessions of 1940. — (2) Within the 1939 boundaries. — (3) Estimate.

The first half of the month of May 1941, which is the time for maize sowing, was very rainy in Bulgaria. Sowings were over during the second part of the month. In June and July, the weather was sufficiently wet and warm, and the maize crop was benefited thereby. In Southern and South-western Bulgaria, drought in the month of August reduced yields.

Taking the Danubian countries as a whole, it must be said that the 1941 season was not favourable to the maize crop and unit yields were about average, as in the case of Romania. Ripening was late nearly everywhere, including the maize producing regions of former Yugoslavia.

As far as Italy and Spain are concerned, no data on the acreage sown to maize in 1941 are available. Only the production data are known, and thus unit yields cannot be calculated. It is certain however, that, owing to unfavourable weather conditions, yields in these two countries were below average.

Exceptionally high yields in the United States make it possible to forecast that in 1941 unit yields in the Northern hemisphere amounted to 26.2 bushels per acre, against 24.6 in 1940 and to 22.8 as an average in the five years 1935/1939 (¹).

In Argentina, from the month of October 1941, which is the time of sowings, to the month of February 1942, the weather was constantly favourable to the maize crop. The result was a high yield per acre sown: exactly 29.4 bushels per acre against 26.7 in 1940/41 and 23.0 in 1939/40 (see Table III). It seems sure that little acreage was destroyed, but no official indication is available on grazed areas.

We have estimated harvested acreages and provisionally calculated the yield by acre of such area as amounting to 34.9 bushels per acre against 33.2 in 1940/41 and 28.2 as an average for the five preceding years. Yields in the whole of the Southern hemisphere may be calculated nearly equal to those of 1940/41, *i. e.* 21.2 bushels per acre, against 21.4 in 1940/41 and an average of 19.8 in the five preceding years.

On the basis of all available information, the world unit yield in 1941 (1941/1942) not including China and the U. S. S. R., may be estimated at 25.2 bushels per acre against 23.9 in 1940 (1940/41) and 22.2 bushels per acre as the average of the previous quinquennium.

IV. — World Maize Production.

Owing to the fact that unit yields in the United States are generally higher than those of the Northern hemisphere, the relative importance of maize production in that country compared with production in the hemisphere is considerably bigger than its maize acreage as compared to the hemisphere acreage. In fact, while the relative importance of the maize area in the United States as compared with that of the Northern hemisphere, averaged 60.2 per cent. during the period 1935/39, 57.1 per cent. in 1940 and 57.4 in 1941, the corresponding production percentages were, respectively, 66.2, 65.7 and 68.2. Thus maize production in the United States is the chief factor which determines the production level of the Northern hemisphere and, in a lesser measure, of the whole world.

The 1941 production in the United States, estimated on November 1 at 2,675 million bushels, was 9.2 per cent. higher than that of 1940, and 2.8 per cent. higher than in 1939. It was, in fact, the highest since 1932, when it amounted to 2,931 million bushels.

The 1932 record production—the biggest one in the last 18 years—(see Tab. 1), was harvested on an acreage of 110.6 million acres, while the 1941 crop was raised on only 85.9 million acres. This good result was due to a very high unit yield: 31.1 bushels per acre in 1941 against 26.5 in 1932. A survey of production in

(¹) The low average yield in the years 1935-1939 in the Northern hemisphere is to be attributed mostly to the extremely low production registered in the United States in 1936.

the United States, shows that, after the disastrous harvest of 1936, this country obtained five consecutive abundant crops, chiefly owing to high unit-yields.

The 1941 production in the Danubian countries was only fair. This poor result is to be attributed to unfavourable weather conditions, to technical difficulties (such as the scarcity of labour and of draft animals) due to the war. Romania is the only country that has recently published an official estimate of its 1941 production. According to that estimate, the production on the territory which had been left to Romania after the 1940 territorial cessions, amounted to 130.4 million bushels against 147.4 millions in 1940. The result was contrary to the optimistic forecasts made at harvesting time.

Romanian maize resources underwent a radical change in the summer of 1941 (a short time before harvesting) when Bessarabia and Northern Bukovina, where maize production is quite abundant, were re-united to Romania.

The Bessarabian maize crop in 1940 had been very good, and surpluses from that province were absorbed by the rest of the country. From the point of view of maize production in South-Eastern Europe, it is worth remarking that in Transnistria (a territory situated between the Dniester and Bug rivers) now under Romanian administration, maize holds first place among all agricultural cultures. According to unofficial information, the area to maize in that territory is estimated at over 2.5 million acres

Italy and Spain have published the statistical data on the 1941 production. No information has been given yet on maize acreage. Maize production in Italy is estimated at 103.5 million bushels against 135.0 in 1940 (a very exceptionally favourable year) and an average of 113.9 million bushels during the period 1935-1939. The 1941 Spanish crop was smaller than that of 1940 and 1939. According to the first estimate, the 1941 production amounted to 27.5 million bushels against 29.2 millions in 1940 and 33.2 millions in 1939. In order to better clear the situation, it may be added that in 1935 (the last year before the civil war for which official data are available) maize production was 29.0 millions bushels and the average during the period 1930-1934, amounted to 27.9 millions.

On the basis of statistical data and available supplementary information, the production of the Northern hemisphere (not including China and the U. S. S. R.) in 1941 may be estimated at 3,925 million bushels 3,728 millions in 1940 and 3,515 millions, average of the years 1935-1939; percentages: 105.3 and 111.7 respectively. It must be noticed that the comparatively low figure of the average is due to the exceptionally small crop of 1936 caused by a long drought in the United States.

The relative importance of the Argentine production in the Southern hemisphere, although not as great as that of the United States in the Northern hemisphere, has gone on increasing during late years as a consequence of the development of the maize culture in that country. In 1931, for the first time, maize production in Argentina amounted to about 400 million bushels. During the following years, not less than four times (in 1935, 1936, 1940 and 1941) were registered greater figures than that. The 1942 production, which follows two very big harvests, is also very high, and amounts to 362 million bushels again 403 millions the year before and to an average of 302 millions during the five pre-

VII. — *World production of maize, by hemispheres.*

(Million bushels of 56 lb.)

Hemispheres	1941 (1941/42)	1940 (1940/41)	Average 1935-1939 (1935/36-1939/40)	% of 1941 (1941-42)	
				1940 (1940/41) = 100	Average = 100
North. Hemisphere (1)	3,925	3,728	3,515	105.3	111.7
including United States	(2,675)	(2,449)	(2,325)	(109.2)	(115.1)
South. Hemisphere	827	874	760	94.6	108.8
including Argentina	(362)	(403)	(302)	(89.9)	(119.9)
World total (1)	*4,752*	*4,602*	*4,275*	*103.3*	*111.2*
including United States and Argentina	(3,037)	(2,852)	(2,627)	(106.5)	(115.6)

(1) Excluding the U. S. S. R. and China.

ceding years; percentages: 89.9 and 119.9 respectively (see Table III). It being the third abundant crop during the present war, it makes the situation of Argentine agriculture considerably worse, because Argentina cannot export to her usual markets the heavy surpluses she has on hand. The Argentine Government is now studying various solutions, among which the raising of pigs on a large scale, in order to transform maize into meat and fat, on the spot. Unfortunately every solution finds an obstacle in the unsurmountable difficulty of large transports of agricultural products to Europe. Thus, if the war continues longer, new reduction of the maize production in Argentina are to be forseseen.

The 1941/42 statistical data for the other important maize producing countries of the Northern hemisphere (Brazil, Union of South Africa, Java and Madoura) are lacking. By taking into account the fact that acreage and unit yelds in these countries, and especially in Brazil, Java and Madoura, do not generally show any remarkable variation, and on the basis of some available information, the 1941/42 production of the whole southern hemisphere may be estimated at 827 million bushels, against 874 millions in 1940/41 and an average of 760 millions during the period 1935/36 to 1939/40.

By adding up the production of the two hemispheres, it will be found that the 1941 (1941/42) world maize production amounted to 4,752 million bushels against 4,602 millions the year before and an average of 4,275 millions in the five preceding years. Thus, the total production of this year would be 3.3 per cent. higher than that comparatively abundant of last year, and 11.2 per cent. above average.

The united production of the two largest world maize producers, the United States and Argentina, amount this year (according to official data) to 3,037 million bushels against 2,852 millions in 1940 (1940/41), and 2,627 million bushels as an average of the five preceding years; percentages: 106.5 and 115.6 respectively.

Conclusions.

In 1941, in agreement with the Government's policy of price support, the acreage to maize in the United States was further reduced. In Europe, owing to the war, maize gained in importance as human foodstuff, but the acreage left to it did not show any tendency to increase, and in some cases, other crops of greater productivity which do not require as much labour as maize, began to take its place. Acreage in Argentina was further reduced owing to difficulties caused by the war to sea-borne trade. All in all, world maize acreage in 1941 was reduced by nearly 1.8 per cent. compared with 1940 (1940/41).

Wheather conditions were exceptionally favourable in the United States and Argentina, while in Europe they were little or not favourable at all.

World production has resulted ramarkably abundant, especially owing to the coincidence of exceptionally good crops in the two world largest producing countries: the United States and Argentina.

CURRENT INFORMATION ON MAIZE.

Greece: At the beginning of May, maize was in full development. It is believed that the area sown to maize this year will be larger than last year

Hungary: At the middle of April the sowing of maize had been started in different regions. Plowing was actively done. Maize germination appeared poor. Maize sowing was still going on by May 5. As compared with this average, the operation was being done late. Cold weather was the cause of the slow shooting of maize.

Romania: According to a recent statistic published by the Ministry of Agriculture, the production of maize in 1941 was 73,000,000 centals (130,000,000 bushels) against 82,500,000 (148,500,000) in 1940. These figures refer to Romanian territories after all the territorial changes in 1940, and therefore they do not include Bessarabia and Northern Bukovina. In the present season, the Government plan foresaw a decrease of the maize crop in the hilly regions, where maize does not always ripe completely. Owing to the difficulties met this year in the sowings of winter cereals (rainy weather, early winter) and in the Spring (rain and cold weather) it is probable that the plan of reduction of the area to maize will not be carried out. The sowing of maize had been started here and there during the last week in April.

Ukraine: See information on cereals at page 142.

Argentina (Telegram of May 29): Weather conditions in May have been quite favorable to maize which was being harvested.

CURRENT INFORMATION ON RICE.

Spain: According to press information, rice production in Spain in 1941/42 amounted to 5.3 million centals—11.8 million bushels, against 6.0 million centals—13.3 million bushels, in 1940 and an average of almost 6.6 million centals—14.7 million bushels in the period 1931/32–1935/36. Considering the lack of fertilizers and the repercussions of the revolution on Spanish agricultural production in general, these results are judged satisfactory.

Romania: Agricultural authorities are facilitating in every possible way the increase of the culture of rice in Romania. Results obtained last year were encouraging, and it may be foreseen that there will be a further increase of area sown to rice. A Syndicate of rice growers has been formed.

CURRENT INFORMATION ON POTATOES.

Spain: So far, the early potato crop in the eastern Mediterranean regions appears in fine condition. Due account must be taken, however, of the decrease of area sown to potatoes this year as compared with the pre-war period.

Hungary: By the middle of April, sowings of early potatoes were over. Preparatory work for the seeding of late varieties was actively going on. By May 5, late varieties had not yet shot everywhere. Warmer weather is desirable.

Romania: The Governmental sowing plan foresees an increase of the area sown to potatoes both in order to replace maize in the colder regions and to seed loose soils. According to statistics of the Ministry of Agriculture, the 1941 potato production in its own area and mixed with maize, was 25,869,000 centals (43,114,000 bushels) against 16,391,000 centals (27,318,000 bushels) in 1940. These figures refer to Romanian territory after all the cessions of 1940 (without Bessarabia, and Northern Bukovina).

Ukraine: According to the plan prepared by the Kiev Agricultural Office which is reproduced by the press, the area to be sown to potatoes this year will amount to 2,000,000 acres against 1,500,000 last year. These figures refer to the occupied parts of Ukraine, with the exception of Transnistria which is under Romanian administration. In order to fully understand the value of these figures, we show in the following table the subdivision of the area sown to potatoes in the different regions in 1938, which is the most recent for which we possess official data. These data are grouped by three zones: (1) zone to which probably refer the data of the Kiev Agricultural Bureau; (2) zone under Romanian administration (regions of Moldavia, Odessa and Nikolaiev; (3) zone on which war is still raging or are beyond the line of war operations (regions of Charkov, Stalino, Soumy and Vorochilovgrad).

Acreage to Potatoes in Ukraine in 1938.

Regions	Acres
Dniepropetrovsk	162,100
Jitomir	327,200
Zaporoje	132,200
Kamenets-Podolsk	262,700
Kiev	475,700
Kirovograd	133,400
Poltava	267,900
Cernigov	430,500
Vinnitsa	341,500
Total	*2,533,200*
Moldavia	56,600
Nikolaiev	79,600
Odessa	112,900
Total	*249,100*
Kharkov	223,100
Stalino	221,400
Soumy	308,100
Vorochilovgrad	146,100
Total	*898,700*
GENERAL TOTAL	**3,681,000**

The table shows that the area to potatoes in 1938 in the first zone amounted to 2,500,000 acres, *i. e.*, almost 70 per cent. of the total area sown to potatoes in Ukraine. In the zone occupied by the Romanians, the area to potatoes in 1938 was 250,000 acres, *i. e.*, nearly 7 per cent. of the total. The insufficient number of agricultural machines, which have been destroyed during war operations, and the dearth of draft animals and labour, were a serious obstacle to plowing and planting. The course of the season (a late Spring, followed by sudden heat) has further shortened the plowing and planting period, which, in normal conditions, were done on a large scale with agricultural machinery.

It must be noticed, however, that in late years, in many regions of Ukraine the method of summer plantation of potatoes had widely spread and had given excellent results.

SUGAR SEASON

After the publication of the April Bulletin, new information about acreage to sugar beets and the condition of the sugar beet crops is not very abundant and such as to give a correct idea of the sugar beet situation in Europe. A summary is here given of whatever information we have received. Our Bureau in Denmark has notified us that, compared with last year, acreage to sugar beets in 1942 will be reduced by 4 per cent. This information runs contrary to a previous one, from another source, according to which there was to have been a small increase. Another information concerning France, estimates at almost 20 per cent. the increase of sugar beet acreages which last year had been considerably reduced.

The National Association of Italian Sugar Beet Growers informs that acreage in Italy has remained practically the same as last year. In Ukraine, on the contrary, there has been a reduction by one half of the acreage sown to sugar beets last year. This decrease must be attributed to present conditions in that country. As regards the other countries, previous information remains unchanged.

Sugar beet sowings in some regions of central and northern Europe were still going on in the first part of May. Germination appears satisfactory, but development is slow. As a rule, the cool weather which continued in May, alternated with great heat waves, has not been favourable to the crop. In the Southern countries, sugar beets are growing better than in the rest of Europe; but on the basis of available information, it may be broadly stated, with the utmost reserve, that in the month of May the conditions of the sugar beet crop have neither improved or grown worse in comparison with the preceding month.

CURRENT INFORMATION ON SUGAR.

Germany: On April 23, 1942 the Ministry of Agriculture and alimentation announced that sugar beet growers, besides the amount of sugar and melasses which they already receive as a premium for an intensification of the sugar beet crop will be granted an additional amount of the same products as a culture premium. This premium for farmers who already last year had grown sugar beets, is 3 kilograms of sugar

(6.6 lb) for each 100 quintals (220 centals) of sugar beets delivered. Farmers who will resume the cultivation of sugar beets during this year or increase the cultivation of this crop in comparison with last year, will be granted 2.5 kilograms (5.5 lb) of sugar per morgen (1/4 ha. = 0.6 acres) of the area sown this year, or of the additional area dedicated to this crop. Each part of morgen added to the calculated amount will be considered as full. The premium will be granted in full even for part of a kilogram above the calculated amount, whose minimum however is 3 kilograms (6.6 lbs).

Instead of sugar, farmers may receive, totally or in part, a double quantity of melasses.

Belgium: Farmers who in 1940/41 had grown sugar beets, are obliged to seed to the same crop at least as large an area this year too. Obligatory crops may be replaced by others of the same order; but as regards sugar beets, this substitution is allowed only on areas outside the amount of last year.

Denmark: From the Institute Bureau in Denmark, we have been notified that the areas to be sown to sugar beets in the coming season will amount to approximately 114,000 acres against 119,000 in 1941 and 99,000 acres in the five preceding years. Percentages: 96.0 and 115.3.

Spain: In order to increase the production of sugar beets the Government, in the official gazette of April 25, published a circular notice whereby farmers who in the next season will sow their fields to sugar beets, will receive different quantities of sugar and pulp according to the amount of sugar beets delivered by them. Thus farmers who will make a contract with the sugar factory of their zone for the delivery of a lesser quantity than last year, will receive 1 kilogram (2.2 lb) of sugar, per ton of sugar beets delivered, those who will deliver the same amount, will receive 1 ½ kilograms (3.3 lb), and those who will deliver a larger amount will receive 2 kilograms (4.4 lb). For a lower quantity than that shown in the contract, only 1/2 kilogram (1.1 lb) of sugar will be granted.

Each farmer who will deliver the amount shown in the contract or a larger amount of sugar beets, will receive 40 kilograms (88 lb) of dry pulp per ton. For a lesser amount, only 20 kilograms (44 lb) of pulp will be granted.

France: The area sown to sugar beets this year amounts to 672,000 acres against 563,000 last year. There has been therefore an increase of 19 per cent.

The Ministry of Agriculture has granted to sugar beet planters a special quota of alcohol amounting to 75,000 hectolitres (1,650,000 Imperial gallons, 2,000,000 American gallons) to be distributed among sugar beet producing departments in proportion with cultivation contracts subscribed in each department.

Hungary: By the middle of April, sowings of sugar beets were being done everywhere, except in Sub-Carpathia. Sowings were still going on towards May 5. The plants shot generally well.

Italy: According to information published by the National Association of Italian Sugar Beet Growres, the acreage sown to sugar beets in Italy this year is about the same as last year. Germination has been regular, except on soils where foreign seeds had been sown. Attacks of Cassida in the province of Ravenna and beet weevil in the province of Littoria are reported. Fifty per cent. of the production will be lost if drought continues. On the whole, however, sugar beet crops in Italy are satisfactory.

Ukraine: According to press information, the Kiev Agricultural Office has communicated a plan whereby the acreage to be sown to sugar beets this year will amount to 865,000 acres against 1,910,000 in 1941, *i. e.*, only 43 per cent. This heavy reduc-

tion must be attributed to the destruction of a considerable number of sugar refineries during war operations.

In order to better establish the value of these figures, in the table below is given the subdivision of sown areas in Ukraine in the year 1938, which is the most recent year for which official data are available.

Acreage to sugar beets in Ukraine in 1938.

Regions	Acres
Dniepropetrovsk	6,200
Jitomir	92,900
Zaporoje	—
Kamenets-Podolsk	211,800
Kiev	384,300
Kirovograd	119,400
Poltava	239,000
Cernigov	64,200
Vinnitsa	418,600
Total	*1,536,400*
Moldavia	22,700
Nikolaiev	4,400
Odessa	66,600
Total	*93,700*
Kharkov	158,200
Stalino	—
Soumy	197,900
Voroshilovgrad	4,900
Total	*361,000*
GENERAL TOTAL	**1,991,100**

It must be remarked that the figure of 865,000 acres indicated above as destined to the culture of sugar beets in the present year and referring to the occupied regions, does not include the provinces of Moldavia, Nikolaiev and Odessa, *i. e.*, the region called Transnistria which is under Romanian administration and which is of slight importance in the production of sugar (93,700 acres in 1938). In the table are indicated separately the regions where war operation are still on or which are beyond that zone, *i. e.*, the zones of Kharkow, Soumy, and Voroshilovgrad which in 1938 had cultivated altogether 361,000 acres.

These two zones, in 1938, represented only 23 per cent. of the acreage sown to sugar beets in the whole of Ukraine. It may be that the part of Ukraine to which are probably referring the data of the Kiev Agricultural Office include the principal center of the Ukrainian sugar beet production.

Little information is available regarding sowings. It is known that a great quantity of agricultural machinery has been destroyed and that the lack of draft animals as well as the dearth of labour hands are heavily felt. On the other hand the course of Spring (the season this year started very late and cold weather was followed by sudden heat) was such as to further complicate plowing and sowings, as it was impossible to employ agricultural machinery which in late years had been very extensively used.

Cuba: It is declared that 90 per cent. of the sugar production of this year will be financed by the United States.

Australia: February rains improved the conditions of sugar cane which had begun to suffer from the drought.

CURRENT INFORMATION ON VINES.

Germany: As was to be expected, vines, after the cold of last winter, suffered damages that may have a remarkable influence on production. Shoots and young plants, following the general rule, suffered less. There is the possibility that more shoots may yet grow. The Riesling vine, this year, has suffered more than the others. It is difficult to get grafts than can resist to the attacks of phyloxera.

Bulgaria: The hard winter cold has strongly damaged many vinyards of Southern Bulgaria (ancient frontiers). In the northern part of the country, where generally timely measures are taken against frost, damages were fewer. On the whole however, the condition of vinyards is comparatively good. Winter cold has retarded by some weeks the resumption of work in the vinyards. Exports of wine to Germany are continuying. Vine growers have received large quantities of copper sulphate. Another large delivery of copper sulphate from Germany is expected at the beginning of May.

Hungary: Vines that had been left uncovered during the winter, were damaged all over the country. By May 5, the plants were developping slowly on account of cold weather.

Romania: Vines that had not been buried during the winter have suffered considerably. The condition of vinyards forecasts an unsatisfactory production.

CURRENT INFORMATION ON FLAX.

Hungary: Autumn flax has suffered damages here and there. About May 5, Spring flax had shot and was growing well everywhere.

Argentina: According to the third official estimate, the linseed production in 1941-42 amounts to 35,274,000 centals (62,990,000 bushels), with a decrease of 1,543,000 (2,755,000) as compared with the preceding estimate published in January. In spite of this decrease, the production of the 1941-42 season is 9.6 per cent. above that of the year 1940-41 (32,179,000 centals — 57,462,000 bushels) and 7.2 per cent. above the average of the five preceding years (32,902,000 centals — 58,754,000 bushels).

(Telegram dated May 29): Weather conditions in May have not been favourable to flax sowing operations.

CURRENT INFORMATION ON COTTON.

United States: According to the revised final estimates, the area cultivated to cotton in 1941 amounted to 23,130,000 acres, compared with 24,871,000 acres in 1940 and 28,496,000 acres on the average for the 5 year period 1935-39; percentages: 93.0 and 81.2. The harvested area is estimated now at 22,240,000 acres, a decrease of 6.8 per cent. in comparison with that of 1940 (23,861,000 acres) and a decrease of 20.0 per cent. compared to the average of the 5-year period 1935-39 (27,788,000 acres). Production has decreased by more than 300,000 bales since the December 1941 cotton report and is estimated finally at 10,744,000 bales of 478 lb. net weight. In comparison with the 12,565,000 bales produced in 1940 and the average production of 13,148,000 bales during the 5-year period 1935-39, the reduction is respectively of 14.5 per cent. and 18.3 per cent. The average yield of lint per harvested acre amounts

to 232 lb. as against 252.5 in 1940 and 205.4 on the average during the 10 year period 1930-39; percentages: 91.9 and 112.9.

According to private estimates, the acreage cultivated to cotton this spring for the cotton year 1942-43 is a little larger than that of 1941. The first official estimate on the acreage of cotton in cultivation ought to be issued on July 8, 1942.

CURRENT INFORMATION ON HEMP.

Hungary: Competent authorities foresee an increase of hemp production within the limits of the program for the increase of oleagineous crops.

Towards May 5, the sowing of hemp was nearly over.

CURRENT INFORMATION ON TOBACCO.

Bulgaria: According to unofficial information, the tobacco production in 1941 over the whole of Bulgaria within the present boundaries, amounted to 137 million lbs., (of which 97 million lbs. were produced within the old frontiers), against 115 millions lbs. in 1940. Thrace produced 22 million lbs., against 51 million lbs. in 1940, and Macedonia (regions of Bitol and Skopie) 18 million lbs., against 24 million lbs. in 1940. The decrease of yields in Bulgaria within the old boundaries must be chiefly attributed to unfavourable weather conditions of the agricultural season in 1941, while the decrease in the newly annexed regions, is attributable to a decrease of area and to war conditions. The Council of Ministers has recently decreed a further increase of 10 per cent. of the area to be sown to tobacco this year within the old frontiers of the country (129.000 acres against 119.000 acres foreseen by the former plan). In Thrace the area to be sown to tobacco must amount to 100.000 acres, of which 70.000 for the first crop and 30.000 for the second crop to be sown after the harvest of winter wheat and barley (in this region cereals ripen towards the end of May). In Macedonia (regions of Bitol and Skoplie) the area to tobacco should amount to 27.000 acres. For the whole of Bulgaria the area to be sown to tobacco this year should amount to 228.000 acres, against 213.000 foreseen by the former plan.

Hungary: About the middle of April, tobacco had regularly shot in the beds. The plants needed sunshine. By May 5 tobacco was being transplanted in many places.

Sweden: According to unofficial information from Malmoe, farmers in Southern Sweden are showing a lively interest in the probable increase of area to be sown to tobacco. In several regions, tobacco would be planted for the first time. In such cases, the tobacco monopoly will grant a premium of 500 crowns for every ha. sown to this crop for the first time. Besides the tendency to the increase of tobacco production, there is the necessity to produce from 26,500 to 33,000 lb. of pure nicotine for the protection of fruit trees and the fight against insects.

CURRENT INFORMATION ON HOPS.

Hungary: Hops grew well during the winter and the crop appeared in fine shape by the middle of April.

THE WORLD COFFEE SITUATION

By Dr. A. Di Fulvio.

The spreading of the war over the Western Hemisphere, where are situated the countries of South and Central America (which account for nearly nine tenths of world coffee production) and the United States which are the most important coffee consumers in the world, has caused the almost complete interruption of our service of statistical information about this product. We are therefore unable to survey in detail as we had always done in the past, the particular situation of each producing and importing country; we must therefore limit ourselves to a broad outlook over the main characteristics of the 1941-42 coffee season and to giving rough estimates based on a few available data. We believe however, that these data are sufficient to give a good idea of the present statistical situation of coffee in the world.

World production.

During several years coffee world production has shown a strong tendency to decrease. This tendency, owing to the combined action of numerous exceptional factors born of the war, became more accentuated during the 1941-42 season. This decrease is noticeable, above all, in Brazil, where, in order to re-establish the balance between the volume of yearly crops (wich represent, as an average, 60 per cent. of world production) and actual export possibilities, the Government in late years took a number of technical and commercial measures extending from the abandonment of vast coffee areas to the prohibition to start new plantations, and from the mass destruction of surplus stocks to the regulation of the commercial movement of exportable production. Available information about Brazil shows that the 1941/42 crop in the State of São Paulo, which accounts for over 2/3 of the country's total production, was over 10 per cent. below average.

The figures of the actual production of the whole country in 1941/42 are still lacking; but we possess the estimate on the « exportable crop » made by the National Coffee Departement, according to which the exportable quantity from the 1941/42 harvest has been figured at about 1,653 million lbs., against 2,756 million lb. in 1940/41 and 2,888 million pounds in the two preceding years.

The regulated distribution by producing States in 1941-42 with the corresponding figures for the year 1940/41 in brackets, is as follows: Sâo Paulo 762 million lb. (1,852); Minas Gerais 402 million lb. (463); Espirito Santo 240 million lb. (198); Rio de Janeiro 76 million lb. (99); Paraná 138 million lbs. (93); Bahia 40 million lb. (33); Pernambuco 26 million lb. (11); Goiàs 8 million lb. (9).

Taking due account of stocks from the exportable surplus of 1940/41, estimated at 794 million lb., the total stock available in Brazil the sale of which has been authorised, amounts to 2,447 million lb. This figure is over 10 per cent. below that of the total exportable amount of the year 1940/41, which in its turn was considerably below the corresponding figures of previous years. In spite of this, however, it is quite doubtful that this amount, though so heavily reduced, may be entirely disposed of during the present season.

World Production by Continents.

CONTINENTS	1941-42 (*)		1940-41		Average 1935-36 to 1939-40		Average 1930-31 to 1934-35	
	Absolute data	Proportion of world production	Absolute data	Proportion of world production	Absolute data	Proportion of world production	Absolute data	Proportion of world production
	(000 lb.)	%	(000 lb.)	%	(000 lb.)	%	(000 lb.)	%
World production	**4,552,561**	**100.0**	**4,883,255**	**100.0**	**5,109,451**	**100.0**	**5,255,838**	**100.0**
America:								
Central and North	595,250	13.1	672,412	13.8	663,153	13.0	593,045	11.3
South	3,373,084	74.1	3,549,454	72.7	3,814,010	74.6	4,153,523	79.0
Total	*3,968,334*	*87.2*	*4,221,866*	*86.5*	*4,477,163*	*87.6*	*4,746,568*	*90.3*
Asia	*264,556*	*5.8*	*297,625*	*6.1*	*313,057*	*6.1*	*293,216*	*5.6*
Africa	*308,648*	*6.8*	*350,536*	*7.1*	*306,003*	*6.0*	*202,826*	*3.9*
Oceania	*11,023*	*0.2*	*13,228*	*0.3*	*13,228*	*0.3*	*13,228*	*0.2*

*) Estimate largely approximate.

As regards the other American countries taken all together, the few available official data and above all the information that has appeared in the press, indicate that, owing chiefly to the upsetting economic and social effects of the war and, in a far lesser degree to adverse weather conditions, the yields of the harvests of the present season have been generally lower than those of previous years.

In order to reduce the cost of production, field work and the industrial treatment of the harvested product this year were less accurate than usual.

In some countries, unfavourable export prospects and the existence of unsold stocks have caused farmers to gather the crop only in those plantations that gave an absolute promise of high yields and of a good quality product.

The total production of Central and South America in 1941/42 may be broadly estimated at almost 3,968 million pounds. This is a small crop, it being 7 per cent. below the already mediocre production of 1940/41.

The total production of Asia, which averages 6 per cent. of the world total, is quite stable. Most of the production of the continent (about 80 per cent.) is yielded by the Netherland Indies where is generaly cultivated the " Robusta " brand which is more resistent to the attacks of " hemileia vastatrix " than the " Coffea Arabica " grown in America.

The results obtained in the Netherland Indies in 1941/42 seem to have been hardly mediocre, not only on account of the already mentioned exceptionally

unfavourable economic and commercial circumstances, but also owing to damages caused by war which was raging in many coffee districts at the time the crop was being harvested.

The production of the continent (including the other coffee growing countries i. e., India, Indochina, Philippines, Timor and Kambing, the average yield of which may be estimated at 44 million lbs.) amounted to 265 million lbs. This figure is over 10 per cent. lower than that of 1940/41 which was below average.

In Africa, the war has caused a stop to the tendency towards a progressive increase of coffee crops that had been noticeable for a number of years especially in Madagascar (which ranks first among the coffee producing countries of that continent), in the Belgian Congo, Tanganyika and Uganda where badly needed labour is quite scarce. The 1941/42 African production estimated at almost 309 million lbs., may be considered average, although it is lower than that of the year 1940/41 by almost 42 million lbs. The total coffee world production in 1941/42 is, on the whole, quite weak, and may be broadly estimated at about 4,553 million lbs.; this figure is 10 per cent. below the average of the five years ending in 1939/40 which was 226 million pounds above that of the year 1940-41.

World trade.

At the breaking of the present war, the situation of the world coffee market was dominated by the following factors:

a) lack of balance, which was evidenced by an excessive exportable yearly production, as compared with world needs;

b) the price war started by Brazil which, since the month of November 1937, had abandoned the policy of " coffee valorisation ";

c) a considerable increase (as compared with preceding years) in the years 1938 and 1939, of the international trade of this product.

Quantities of Coffee destroyed in Brazil by seasons.

(000 pounds)

SEASON (July 1-June 30)	Production	Quantities destroyed			Percentage of production
		First half-year	Second half-year	Total	
					%
1931-32	2,869,767	(1) 373,685	720,694	(2) 1,094,379	38.1
1932-33	3,385,650	513,458	816,154	1,329,612	39.3
1933-34	3,916,746	1,023,830	436,296	1,460,126	37.3
1934-35	3,643,151	657,200	134,042	791,242	21.7
1935-36	2,504,239	89,949	104,059	194,008	7.7
1936-37	3,476,702	389,558	1,051,388	1,440,946	41.4
1937-38	3,220,964	1,223,790	693,577	1,917,367	59.5
1938-39	3,095,521	365,307	248,903	614,210	19.8
1939-40	2,918,930	216,715	99,870	316,585	10.8
1940-41	2,755,787	272,492	73,414	345,906	12.6

(1) Seven months. — (2) Thirteen months.

Besides taking measures intended to limit coffee production, Brazil, up to the time of the beginning of the war, had destroyed an enormous mass of surpluses (over 8,800 million pounds) which would have been sufficient to meet world demand for two years and a half.

The breaking of the war found the coffee world market still upset by a crisis of over-production, but in a phase of improvement, susceptible of a further favourable development as a consequence of the elimination of so heavy a mass of stocks and of the new commercial policy of free competition inaugurated nearly two years before by Brazil.

This country's exportations during the solar year 1939 had reached an exceptionally high level: 13.2 per cent. higher, in fact, than the average export figures of the five years 1934-38.

Brazil. — Export of Coffee by calendar year.

(000 lb.).

1941	1,462,111
1940	1,593,727
1939	2,182,363
Average 1934 to 1938	*1,928,610*
Average 1929 to 1933	*1,979,317*
Average 1924 to 1928	*1,864,015*

Colombian exports in 1939 had also been exceptionally high. These two countries, in the five years 1934/38, had contributed respectively 52.6 per cent. and 13.8 per cent., i. e., 2/3 of average world exports.

The year 1940 shows a strong decrease of coffee world trade The spreading of the war over Europe and the intensification of the blockade and of maritime war, practically closed the European market which, up to that time, had absorbed nearly 43 per cent. of net imports registered in the whole world. Since the summer of 1940, European demand was limited to the few neutral countries (Sweden, Spain, Portugal and Switzerland) which in the five years 1934/38 had imported hardly 13 per cent. of the continent's total. The United Kingdom which in the consumption of coffee occupies a very low position, and unoccupied France provisioned thenselves on a reduced scale from their own colonies. But, owing chiefly to the lack of tonnage and to the risks and difficulties of all kinds caused by war, to sea trade-borne the import of all these neutral and belligerent countries fell, in the years 1940 and 1941, to a very low figure.

The only important market that at present may still absorb the world exportable surpluses, is the United States, which is the world greatest coffee consumer and which, during late years, had imported over one half of the whole world net imports. Since November 1940, imports to the United States are regulated by the "Inter-American Coffee Agreement" signed at Washington by that country and the 14 coffee producing countries appearing in the table below. This agreement whose fulfilment was confided to the Inter-American Coffee Office sitting at

Yearly quotas of exporting countries signatory to the Agreement in comparison with the average exports of each of them during the 5-year period 1934 to 1938.

Exporting Countries	Average exports 1934 to 1938		Exporting quotas into the United States (Oct. 1, 1940 to Sept. 30, 1941)		
			Basic quotas	Amended quotas	
	Absolute data	Proportion of word total	Absolute data	Absolute data	Proportion of averaged export of each country
	(1,000 pounds)	%	(1,000 pounds)	(1,000 pounds)	%
Brazil	1,928,610	52.6	1,230,184	1,285,079	66.6
Colombia	506,624	13.8	416,675	435,194	85.9
Costa Rica	51,147	1.4	26,456	27,778	54.3
Cuba	8,378	0.2	10,582	11,023	131.6
Dominican Republic	22,708	0.6	15,873	16,535	72.8
Ecuador	30,865	0.9	19,842	20,724	67.1
Salvador	119,491	3.3	79,367	82,894	69.4
Guatemala	103,618	2.8	70,769	73,855	71.3
Haiti	61,289	1.7	36,376	37,920	61.9
Honduras	3,527	0.1	2,646	2,866	81.2
Mexico	80,469	2.2	62,832	65,698	81.6
Nicaragua	33,731	0.9	25,794	26,896	79.7
Peru	6,614	0.2	3,307	3,527	53.3
Venezuela	116,845	3.2	55,557	57,982	49.6
Total of considered countries	*3,073,916*	*83.9*	*2,056,260*	*2,147,971*	*69.9*
Other countries	*591,282*	*16.1*	*46,959*	*49,163*	*8.3*
World total	3,665,198	100.0	2,103,219	2,197,134	59.9

Washington, had fixed for each one of the 14 producing signatory countries some yearly base-quotas to be exported to the United States from October 1 1940 to September 30 1941, up to a total of 2,056 million pounds. The basic quotas in agreement with the resolutions of the Interamerican Coffee Office, dated May 28 and August 2 1941, have been increased 5 per cent. and 20 per cent. respectively. These increases in their turn have increased by 4.5 per cent. the total of the basic quotas previously agreed upon, which have therefore gone up from 2,056, million pounds to 2,148 million pounds. This quantity represents almost 70 per cent. of the total average exportation of the 14 countries signatories of the agreement during the five years ending in 1938. The Washington document had also fixed for each country the quotas of exports to all the other countries of the world. But, while exports to the United States, both from the signatory and all the other countries, has proceeded normally, so as to entirely absorb and sometimes even exceed the basic quotas, contingents left for export to other countries have found a very limited market in Europe and elsewhere outside of Europe.

Coffee imports to the United States during the period October 1 1940-September 30 1941 registered an absolute record by going 1/4 beyond the averages

of the five years ending in 1938. The 14 countries that signed the Washington agreement account for 97.8 per cent. of the imported total, against 95.9 per cent. which was the average of the years 1934-38.

United States. — Imports of Coffee.

Exporting Countries	Imports into the United States Average 1934 to 1938		Quotas to be imported into the United States (October 1, 1940 to September 30, 1941)		
			Basic quotas	Amended quotas	
	Absolute data	Proportion of general total	Absolute data	Absolute data	Proportion of general total
	(1,000 pounds)	%	(1,000 pounds)	1,000) pounds)	%
Brazil	1,048,963	60.3	1,230,184	1,285,079	58.5
Colombia	383,826	22.1	416,675	435,194	19.8
Costa Rica	9,259	0.5	26,456	27,778	1.3
Cuba	3,968	0.2	10,582	11,023	0.5
Dominican Republic	4,409	0.3	15,873	16,535	0.8
Ecuador	9,039	0.5	19,842	20,724	0.9
Salvador	60,627	3.5	79,367	82,894	3.8
Guatemala	46,297	2.7	70,769	73,855	3.4
Haiti	6,834	0.4	36,376	37,920	1.7
Honduras	882	0.1	2,646	2,866	0.1
Mexico	44,093	2.5	62,832	65,698	3.0
Nicaragua	10,582	0.6	25,794	26,896	1.2
Peru	220	0.0	3,307	3,527	0.2
Venezuela	39,242	2.2	55,557	57,982	2.6
Total of considered countries	*1,668,241*	*95.9*	*2,056,260*	*2,147,971*	*97.8*
Other countries	*72,091*	*4.1*	*46,959*	*49,163*	*2.2*
General total	1,740,332	100.0	2,103,219	2,197,134	100.0

In spite of the exceptional increase of their importations, the United States have not been able to absorb the whole of world surpluses. It follows that more or less important stocks have accumulated during the last two years in nearly all coffee producing countries. Thus the problem of surpluses which before the war was exclusively Brazilian (the other exporting countries had regularly disposed of their yearly exportable stocks), has now become common to almost all coffee producing countries.

Prices.

The Inter - American Coffee Agreement considered from a purely commercial viewpoint, aimed, among other things, at:

a) eliminating the sharp competition on the United States market, which was the only large one still open to imports, by the adoption of import quotas assured to each country;

b) fixing satisfactory sale prices agreable both to producers and consumers. While the first aim of the agreement has been easily fulfilled because each country

has regularly exported the amounts fixed, the second whose purpose was the fixing of an equitable price in favour of producers, met whith many obstacles in the responsible and commercial centers of the United States.

When all efforts to reach a general agreement on prices failed altogether, the Colombian Governement, in November 1940, fixed some minima prices in American dollars, F. O. B. Port Colombien, for the different commercial types of coffee produced in the country. These prices, which were considerably higher than those in force till then, were further increased at different times. The example of Colombia was followed by most of the other countries that produce coffee " Milds ", and lastly also by Brazil which in July 1941 fixed at 3 cent. of American dollars the differential proportion between Santos Nº 4 and Colombian Manizales.

CURRENT INFORMATION ON OTHER PRODUCTS.

Colza and Sesame.

Bulgaria: Good weather conditions during the present Spring and an increase of area sown to sesame give a good promise of a fine crop. The forecast is for 110.000 centals (5.500 short tons). It is estimated that home consumption will absorb 55.000 centals (2.750 short tons), so that one half of the sesame production this year can be left for exportation.

Hungary: Conditions at April 14 showed that winter colza did not grow well during the winter. In some provinces, from 50 to 60 per cent. of the crop was destroyed by the excessive cold of the winter. Floods caused other damages. Flowering had began here and there by May 5. The crop needed warmer weather.

Soya.

Hungary: Competent authorities foresee an increase of the production of soya within the limits of the program for the increase of oleagineous crops.

CURRENT INFORMATION ON FODDER CROPS.

Hungary: Towards the middle of April, the sowing of Spring fodder beets had begun everywhere, except Sub-Carpathia. At the beginning of May the condition of the clover and lucerne crops was not satisfactory. These crops had greatly suffered from winter cold and floods. Spring sowings of clover and meteils of vetch and oats have shot very well. Owing to the great humidity of the soil, it is hoped that these crops will develop rapidly as soon as the weather becomes warmer. About the 5th May, natural meadows and pastures situated in the low regions were covered with water on account of frequent rains. The vegetation of higher pastures and meadows is slow on account of cold weather.

Switzerland: The cold weather in April was very damaging to the growth of grass. The condition of natural and artificial meadows is now considered far worse than a month ago. Natural meadows especially appear to have suffered badly. The growth

of the grass started late and was very slow. As a result, green forage started growing late. As may be seen in many vast regions rouges caused serious damage this Spring. The condition of natural meadows, according to the system of the country, was quoted 72 on May 1, against 79 at April 1 1942 and 71 at May 1, 1941. Notations for artificial meadows (clover, lucerne, etc.) are respectively as follows: 75, 80 and 76.

Argentina: Owing to bad weather prevailing during the month of May, the condition of pastures has grown worse.

LIVESTOCK AND DERIVATIVES

NUMBER OF LIVESTOCK IN THE PROTECTORATE OF BOHEMIA AND MORAVIA.

The livestock census taken in December 1941 showed that the number of livestock heads was as follows: Cattle, 2.100.000; pigs, 1.820.000; goats, 900.000.

HORSES, CATTLE AND POULTRY IN DENMARK *).

(Thousand)

Classification	March 21 1942	July 12 1941	April 19 1941	March 8 1941	June 29 1940	July 15 1939	July 15 1938
Horses	*544*	*589*	*540*	—	*575*	*577*	*564*
Colts under 1 year	45	58	30	—	53	53	50
Colts from 1 to 3 years	78	95	84	—	93	92	88
Stallions 3 years old and over	4	4	4	—	4	4	4
Geldings 3 years old and over	192	201	197	—	200	203	202
Mares 3 years old and over	225	231	225	—	225	225	220
Cattle	*2,831*	*3,014*	*3,068*	*2,976*	*3,226*	*3,271*	*3,186*
Calves under 1 year old	679	795	773	803	862	852	834
Bulls 1 year old and over	59	58	67	59	64	68	63
Steers	70	77	78	66	74	78	80
Heifers 1 year old and over	628	622	644	565	635	659	610
Cows and heifers having farrowed	1,395	1,462	1,506	1,483	1,591	1,614	1,599
Fowls	*5,908*	*11,948*	*8,352*	*8,055*	*21,865*	*29,126*	—
Chicken under 6 months	—	5,001	347	—	9,673	16,901	—
Cocks 6 months old and over	170	97	160	171	127	150	—
Hens 6 months old and over	5,738	6,850	7,845	7,884	12,065	12,075	—

(*) Rural districts.

MILK PRODUCTS IN NORWAY.

The Union of Norwegian Milk Producers, in its Report for the year 1941, has published the following data relative to milk products (thousand pounds).

Products	1941	1940	1939	1938	1937	1936
	lb.					
Butter	18,343	29,792	39,276	33,038	26,897	24,922
Cheese (total)	29,087	32,174	39,494	40,447	38,863	38,187
of which:						
Cheese of unskimmed milk	15,020	18,191	22,308	23,279	21,893	21,489
Whey cheese	14,067	13,983	17,186	17,167	16,970	16,698

WOOL PRODUCTION IN THE UNION OF SOUTH AFRICA.

The wool clip in the year ending June 30, 1942 is estimated et 250,450,000 lb. as against 241,370,000 lb. in 1940-41.

SHEEP IN AUSTRALIA

The numbers of sheep in Australia for each year from 1932 to 1941 are as follows:

Sheep in Australia on March 31. (*)

Year	Number
1941	121,364,000
1940	118,818,000
1939	111,057,800
1938	113,372,500
1937	110,242,700
1936	108,875,800
1935	113,048,000
1934	109,921,100
1933	112,926,900
1932	110,618,900

(*) For some States, December 31 of the preceding year.

WOOL PRODUCTION IN AUSTRALIA.

According to a report issued by the Bank of Australia, wool production (greasy basis, wool clip plus skin wool) in Australia in the year ending June 30, 1941 is estimated at 1,109 million lb., compared with 1,128 million lb. (revised estimate) in 1939-40 and 995 million lb. the average for the five preceding years; percentages: 98.3 and 111.5.

WOOL PRODUCTION IN NEW-ZEALAND.

According to a report issued by the Bank of Australia, total wool production, greasy basis, in 1940-41 amounted to 331,800,000 lb., compared with 310,800,000 lb., in 1939-40, an increase of about 7 per cent. In comparison with the average production during the 5- year period 1934-35 to 1938-39, 294,800,000 lb., the increase amounts to about 13 per cent.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Bulgaria: According to official information, the production of milk in Bulgaria (old frontiers) in the year 1941 amounted to 150 million gallons (175 million American gallons). Of this quantity, 12 million Imperial gallons (15 million American gallons) i. e., about 1/10, were delivered to factories for transformation. 11 million Imperial gallons (13 million American gallons), i. e., about 90 per cent. of the total delivered to factories, were furnished by sheep and the rest by milch cows, buffaloes and goats.

Hungary: At the beginning of February the 15 Central Stations for artificial hatching created by the Ministry of Agriculture, with a view to the rationalisation of Hungarian aviculture, began the distribution at favourable prices of chicklings one day old. This year the number of chicklings of a fine breed to be distributed to hatcheries will amount to about 1,5 millions.

Sweden: According to a report from the Central Egg Union, the production of eggs fell from 22,818,278 lbs. in 1940 to 16,709,415 lbs. in 1941, showing a decrease of 26.8 pgr cent. The decrease was particularly marked in second semester of the year. Compared to the corresponding months of 1940, percentages were 75 in the month of July 1941, 68 in the month of August, 76 in the month of September, 45 in the month of October, 30 in the month of November and 53 in the month of December 1941.

Argentina: Following the reduction of cereal exports and owing to favourable conditions for the exportation of products of animal origin, the Argentine Government has put aside the sum of 100 million pesos for the purchase of land in the maize producing zone to be put at the disposal of farmers who should create farms where different crops should be grown and the milk industry should be developped. 30 million pesos will be deposited immediately: the remainder will be deposited at the rate of 10 million pesos per year. From 1000 to 4000 pesos will be granted to individual farmers in order to encourage them to buy and fatten livestock, especially pigs. By these means it is hoped that the consumption of maize as fodder will increase.

CURRENT INFORMATION ON SERICULTURE.

France: According to the latest information total production of fresh cocoons in 1941 amounted to 1,310,000 lb., against 1,284,000 in 1940 and 1,369,000 on the average of the 5-year period 1935-39. Accordingly, there is an increase of 2.0 per cent. in 1941 over the production of 1940, but a decrease of 4.3 per cent. in comparison with the average. In 1941 the fresh cocoon production would have amounted to 1,433,000 lb. if prevailing weather conditions had not been unfavourable and if the excess of silkworm eggs in incubation (942 ounces more than in 1940) had been hatched out normally.

TRADE

PORTUGAL

Products and Units	March				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1942	1941	1942	1941	1942 or 1941-42	1941 or 1940-41	1942 or 1941-42	1941 or 1940-41	1941 or 1940-41	1941 or 1940-41
Wheat: 1,000 centals	0	0	0	11	0	0	1,872	1,964	0	2,251
» : Thous. bush. of 60 lb.	0	0	0	18	0	0	3,120	3,274	0	3,752
Wheat flour: 1,000 centals	0	0	0	0	3	0	10	15	0	18
Wheat flour: Thous. bush. of 196 lb.	0	0	0	0	2	0	5	8	0	9
Maize: 1,000 centals.	0	0	245	59	0	0	573	330	9	1,742
» : Thous. bush. of 56 lb.	0	0	437	106	0	0	1,022	589	17	3,111
Rice: 1,000 centals	0	0	0	0	0	0	2	1	38	86
» : Thous. bush. of 45 lb.	0	0	0	0	0	0	5	1	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	11	0	11
» : Thous. bush. of 56 lb.	0	0	0	0	0	0	0	19	0	19
Cotton: 1,000 centals	0	0	29	23	0	0	342	222	0	427
» : Thous. bales of 478 lb.	0	0	6	5	0	0	72	46	0	89
Wool: 1,000 lb.	0	0	13	0	0	0	789	132	0	7,086
Butter: » »	31	22	0	0	68	46	0	0	313	0
Cheese: » »	57	26	0	0	86	73	0	20	317	37
Cacao: » »	0	0	150	128	4	0	946	1,208	119	2,597
Tea: » »	—	—	71	44	—	—	293	258	—	492
Coffee: » »	2	165	2,355	2,401	278	2,588	5,783	11,771	3,305	15,413

SWEDEN: Imports.

Products and Units		March		Total from the beginning of the season *)		Total of the season *)
		1942	1941	1941-42	1940-41	1940-41
Wheat	1,000 centals	11	0	12	277	277
	Thous. bush. of 60 lb.	18	0	20	461	461
Rye	1,000 centals	11	0	11	835	835
	Thous. bush. of 56 lb.	20	0	20	1,491	1,491
Maize	1,000 centals	1	0	53	170	695
	Thous. bush. of 32 lb.	3	0	166	533	2,172

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao, November 1st for maize.

CHILE: Wool exports.

Wool exportation from Chile in the month of March 1942 has been of 6,230,284 lb.

SALVADOR: Coffee exports.

Coffee expo rtation from Salvador in the year 1941 of 92,594,460 lb.

PORTUGUESE GUINEA.

Products and Units		November 1941	November 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.						
Wheat flour	1000 centals	0	0	1	0	1
» »	Thous. bush. of 196 lb.	0	0	1	0	1
Butter	1000 lb.	0	2	24	15	18
Cheese	» »	0	...	15	...	...
Exports.						
Rice	1000 centals	1	0	113	161	161
»	Thous. bush. of 45 lb.	2	0	252	358	358

MOZAMBIQUE.

Products and Units		September 1941	September 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.						
Wheat flour	1000 centals	41	2	49	12	149
» »	Thous. bush. of 196 lb.	21	1	25	6	76
Rice	1000 centals	13	8	115	102	125
»	Thous. bush. of 45 lb.	28	17	255	226	278
Butter	1000 lb.	60	40	496	465	611
Cheese	» »	31	13	194	146	198
Coffee	» »	60	46	128	...	...
Exports.						
Tea	1000 lb.	0	152	132	...	...

ANGOLA.

Products and Units		August 1941	August 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.						
Butter	1000 lb.	2	2	18	20	33
Cheese	» »	15	9	53	60	93
Exports.						
Rice	1000 centals	8	10	24	22	25
»	Thous. bush. of 45 lb.	17	22	53	49	55
Coffee	1000 lb.	840	1,206	897	1,356	17,174

*) See note page 174.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	May 15, 1942	May 8, 1942	May 1, 1942	April 24, 1942	April 17, 1942	Monthly averages				
						April 1942	May 1941	May 1940	May 1939	May 1938
Wheat.										
Winnipeg (cents p. 60 lb.):										
delivery May	79 1/4	79 1/4	79 1/4	79 1/4	79 1/4	79 1/4	75 7/8	78 7/8	64 3/4	114 1/2
„ July	80 3/8	80 3/8	80 3/8	80 3/8	80 3/8	80 3/8	77 1/2	80 1/8	65 3/4	103 1/8
„ October	—	—	—	—	—	—	—	82 3/8	66 7/8	84 7/8
Chicago (cents. p. 60 lb):										
delivery May	120 3/4	122 1/8	120 1/4	121 1/2	119 1/8	122 1/4	96 5/8	100 3/4	* 77 1/2	* 80 1/8
„ July	123	125 1/4	123 3/8	123 7/8	121 1/2	124 3/8	95 3/8	92 7/8	75	76 5/8
„ September	125 1/8	127 1/4	125 3/4	125 7/8	123 3/4	126 3/8	96 1/8	93 1/8	74 7/8	77 1/2
Rye.										
Winnipeg (cents p. 56 lb.):										
delivery May	63	64	62 3/4	63 5/8	64 5/8	64 3/4	60 1/8	61	44 3/4	* 58 7/8
„ July	63 3/4	65 1/4	64	64 7/8	65 5/8	65 3/4	59 1/4	61 3/8	46 5/8	58 5/8
„ October	65	66 1/2	65 1/4	66 1/4	66 5/8	66 1/2	56	59 7/8	47 1/2	* 56 1/8
Chicago (cents p. 56 lb.):										
delivery May	71 7/8	75 1/2	74 1/8	75	75	76 3/4	* 49 1/8	* 61	* 46 3/4	* 59
„ July	74 1/8	78 1/2	77 1/2	78	77 3/4	79 5/8	56 5/8	55 7/8	49 3/4	56 3/4
„ September	77	81 5/8	80 4/8	80 7/8	80 3/8	82 3/8	57	57 5/8	50 7/8	55 1/8
„ December	80 1/4	84 3/4	—	—	—	—	—	—	—	—
Barley.										
Winnipeg (cents p. 48 lb.):										
delivery May	64 3/4	64 3/4	64 3/4	64 3/4	64 3/4	64 3/4	50 1/2	43 1/8	* 40 1/2	* 58 7/8
„ July	64 3/4	64 3/4	64 3/4	64 3/4	64 3/8	64 3/8	48 3/8	43 1/2	39 7/8	57 1/8
„ October	64 3/4	64 1/8	63 1/8	63 3/4	62 3/4	62 7/8	44 5/8	43 1/2	39 1/4	54
Oats.										
Winnipeg cents p. 34 lb.):										
delivery May	51 1/2	51 1/2	51 1/2	51 1/2	51 3/8	51 3/8	37	* 35 5/8	30 1/2	49 1/2
„ July	51 1/2	51 1/2	51 1/2	51 1/2	50 1/2	50 5/8	35 5/8	* 34 3/8	30 1/8	46 1/8
„ October	50 1/2	50 7/8	50 1/4	50 3/8	49 1/4	49 5/8	33 1/4	* 33	29 3/4	40 1/4
Chicago (cents p. 32 lb.):										
delivery May	56 1/2	57 1/4	55 3/4	55 3/4	55	55 3/4	* 37 5/8	* 40 1/2	* 33 7/8	* 28 7/8
„ July	55 5/8	56 1/2	55 3/4	55 5/8	55 1/2	55 3/4	35 3/8	35 3/8	32 5/8	26 7/8
„ September	55 3/4	56 5/8	56 1/4	56 1/4	56 1/2	56 1/2	34 3/4	33 1/8	31	26 1/2
Maize.										
Chicago (cents p. 56 lb.):										
delivery May	85 7/8	86 3/4	85	85 1/4	85 3/4	87 1/4	* 70 5/8	* 64 1/4	50 1/8	* 58
„ July	88 7/8	89 1/2	87 5/8	88 1/8	88 3/8	89 1/4	72	63 7/8	51 1/2	58 1/2
„ September	91	91 5/8	89 3/4	90 1/4	90 3/8	91 1/2	73	63 1/2	52 1/4	59 1/2
„ December	93 1/2	94 1/4	—	—	—	—	—	—	—	—
Linseed.										
Winnipeg (cents per 56 lb.):										
delivery May	164	164	164	164	164	164	149 1/4	178 1/2	150 1/4	147 [illegible]
„ July	164	164	164	164	164	164	151 3/8	180 7/8	152 1/4	147 3/8
„ October	164	164	164	164	164	164	148 7/8	183	142 3/4	146 5/8

* Indicates that the product was not quoted during part of the period under review.

AVERAGE MONTHLY PRICES BY COUNTRIES.(1)

Groups	Description	March 1942	Feb. 1942	Jan. 1942	Oct.-Dec. 1941	Jan.-March 1941	Jan.-March 1940	Agricultural year (2) 1940-41	Agricultural year (2) 1939-40
		Average							
	GERMANY (Prices in Reichsmarks per quintal).								
A I	Wheat (producer's price; Berlin)	21.00	21.00	20.80	20.47	20.80	20.80	20.50	20.50
	Rye (producer's price; Berlin)	19.30	19.30	19.10	18.77	19.10	19.10	18.80	18.80
	Barley, feeding (producer's price; Berlin)	17.70	17.60	17.40	17.00	17.57	17.57	17.22	17.22
	Oats (producer's price; Berlin)	18.50	18.40	18.30	18.10	18.40	17.70	18.28	17.65
	Potatoes, red (Berlin)	5.20	5.50	5.30	4.63	4.93	4.93	* 5.07	* 4.90
	Hops (Nürnberg)	480.00	480.00	480.00	476.70	440.00	462.00	451.15	* 457.60
A II	Oxen, live weight (Berlin)	84.60	84.80	86.40	87.66	82.93	85.73	81.17	87.20
	Calves, live weight (Berlin)	93.60	93.60	93.60	93.60	95.40	95.40	95.12	95.25
	Pigs, 220-265 lb., live weight (Berlin)	120.00	118.00	111.60	111.53	104.00	104.00	106.98	104.70
	Milk, fresh (Berlin) per hectolitre (3)	18.44	18.44	18.50	19.10	19.10	17.56	19.09	* 17.74
	Butter, National Mark (at dairy factory)	315.00	315.00	315.00	315.00	313.00	283.00	313.00	286.00
	Creamery butter (at dairy factory)	299.00	299.00	299.00	299.00	297.00	268.50	297.00	271.30
	Cheese, Emmenthal type (Kempten)	186.75	186.75	186.75	186.75	186.75	170.79	186.75	172.13
	Soft cheese, 20 % butterfat (Kempten)	65.25	65.25	65.25	65,25	65.25	60.19	65.25	60.36
	Eggs, aver. size, marked "GIB." (Berlin) per 100	10.50	10.50	12.11	11.50	11.04	11.03	10.88	10.88
B I	Basic slag, 16 % (Aachen) (4)	0.220	0.220	0.220	0.203	0.220	0.193	0.208	0.200
	Superphosphate of lime, 18 % (4-5)	0.314	0.314	0.307	0.304	0.312	0.312	0.309	0.309
	Potash salts, 40 % (5)	5.24	5.24	5.24	5.08	5.24	5.24	5.05	5.06
	Sulphate of ammonia, 21% (4-5)	0.480	0.480	0.475	0.455	0.478	0.477	0.454	0.451
B II	Wheat-bran (Hamburg)	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
	Rye bran (Hamburg)	10.25	10.25	10.25	10.25	10.75	10.75	10.75	10.75
	Oaten pods (Northern Germany)	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
	Potato flakes (Hamburg)	18.30	18.30	18.10	17.76	17.10	17.10	16.80	16.88
	Dried sugarbeet residue	12.23	12.09	11.95	11.81	12.09	12.09	12.33	12.32
	Rapeseed cake meal	14.22	14.22	14.22	14.22	14,22	—	14.22	* 14.22
	BELGIUM (Prices in Belgian francs per quintal)								
A I	Wheat (producer's price) (6)	n. q.	200.00	201.00	209.00	170.00	152.45	170.10	* 142.95
	Rye (producer's price) (6)	n. q.	190.00	191.00	199.00	155.00	138.55	* 155.00	* 129.95
	Barley (producer's prices) (6)	n. q.	185.00	185.00	185.00	150.00	171.95	* 150.00	* 159.85
	Oats (producer's price) (6)	180.00	180.00	180.00	180.00	145.00	121.50	* 145.00	* 104.65
	Potatoes (producer's price) (7)	80.00	75.00	75.00	75.00	71.35	45.40	* 71.40	* 38.50
	Flaxen-straw (producer's price) (8)	150.00	150.00	150.00	150.00	150.00	186.65	* 150.00	* 146.20
A II	Oxen, live weight (producer's price)	1,025.00	1,025.00	1,025.00	1,025.00	875.00	...	* 855.00	...
	Calves, live weight (producer's price)	1,125.00	1,125.00	1,125.00	1,125.00	941.65	...	* 925.00	..
	Pigs, 220-265 lb., live weight (producer's price)	1,125.00	1,125.00	1,125.00	1,125,00	1,041.65	...	* 1,055.00	...
	Dairy butter, whith quality mark (at dairy factory) (8)	3,100.00	3,100.00	3,100.00	3,100.00	3,100.00	2,367.00	*3,100.00	*2,165.00
	Farm butter (at farm) (8)	2,800.00	2,800.00	2,800.00	2,800.00	2,600.00		*2,620.00	
	Eggs (producer's price) (9) per 100	135.00	135.00	135.00	135.00	110.00	69,00	94.40	* 68.55
B II	Meadow-hay (producer's price)	56.00	56.00	56.00	56.00	56.00	...	* 56.00	...
	Clover-hay (producer's price)	70.00	70.00	70.00	70.00	70.00	...	* 70.00	...
	Wheaten straw (producer's price) (8)	35.00	35.00	35.00	35.00	33.85	56.00	* 31.85	* 39.90
	Fresh sugar-beet pulp (sold to producers)	90.00	90.00	90.00	90.00	65.00	...	* 65.00	..

* Indicates that the product was not quoted during part of the period under review. — n. q. = not quoted. — n. = nominal.

(1) Prices of plant (A I) and animal (A II) products sold by the farmer, also of fertilizers (B I) and concentrated feeding stuffs (B II) bought by the farmer. In cases where the market is not indicated, the price is the average for the whole country. — (2) July to June. — (3) Formely: milk for liquid consumption, later on: mainly milk for industrial purposes. — (4) Price per kg. of active fertilizer contained in 100 kg. of commercial fertilizer. — (5) Free at buyer's station. — (6) Agricultural year 1939-40: prices at Antwerp market. — (7) Agricultural year 1939-40: prices at Louvain market. — (8) Before Sept. 1940: averages prices on the main markets. — (9) Agricultural year 1939-40: average prices on the main markets.

DENMARK (Prices in Danish crowns per quintal).

Groups	Description	March 1942	Feb. 1942	Jan. 1942	Average Oct.-Dec. 1941	Average Jan.-March 1941	Average Jan.-March 1940	Agricultural year 1940-41	Agricultural year 1939-40
A I	Wheat (producer's price)	28.00	28.00	28.00	28.00	28.00	18.40	26.49	* 18.36
	Rye (producer's price)	29.00	29.00	29.00	29.00	29.00	19.40	27.49	* 19.36
	Barley (producer's price)	25.00	25.00	25.00	25.00	25.00	17.40	23.82	* 17.36
	Oats (producer's price)	25.00	25.00	25.00	25.00	25.00	17.40	23.82	* 17.36
	Potatoes (producer's price, Zealand)	16.70	15.12	13.62	14.02	14.79	9.92	* 14.62	* 9.37
A II	Cows, live weight (København)	102.00	97.50	95.00	100.95	90.62	52.85	83.83	50.99
	Pork, dead weight (producer's price)	248.00	244.00	244.00	241.86	235.73	186.33	219.90	180.23
	Fresh milk (producer's price)	23.46	23.46	23.46	23.46	23.46	16.75	22.18	15.57
	Butter (København)	389.00	389.00	389.00	389.00	389.00	268.20	374.56	252.76
	Whole milk cheese, 45 % (Odense) (¹)	180.00	180.00	180.00	180.00	185,68	169.17	* 182.84	152.31
	Eggs, for export (producer's price)	220,00	220.00	232.00	240.80	174.87	122.50	173.57	122.33
B I	Superphosphate, 18 %	n. q.	n. q.	15.50	15.50	n. q.	8.90	* 13.45	7.95
	Potash salts, 40 %	19.55	19.35	20.10	19.50	19.45	17.33	18.57	16.15
	Sulphate of ammonia, 20,8 %	23.60	23.40	24.30	23.88	22.80	18.25	21.75	17.70
	Nitrate of lime, 15 ½ %	24.15	23.95	23.75	23.46	22.60	18.20	21.69	17.65
B II	Wheat-bran, Danish	22.00	22.00	22.00	22.00	n. q.	* 20.00	* 23.62	* 16.82
	Buttermilkpowder	n. q.	n. q.	n. q.	n. q.	116.33	91.33	104.11	* 86.05
	Hay	40.20	38.25	36.80	34.68	32.00	13.60	* 30.96	* 10.83
	Oaten-straw	21.60	20.00	19.00	16.93	15.73	3.71	* 14.41	* 3.41

FRANCE (Prices in francs per quintal)

Groups	Description	March 1942	Feb. 1942	Jan. 1942	Average Oct.-Dec. 1941	Average Jan.-March 1941	Average Jan.-March 1940	Agricultural year 1940-41	Agricultural year 1939-40
A I	Wheat (producer's price)	300.00	300.00	300.00	300.00	229.75	200.00	222.65	198.70
	Rye (producer's price) (²)	244.00	244.00	244.00	244.00	175.00	153.65	* 174.50	* 128.50
	Barley, malting (producer's price) (²)	229.00	229.00	229.00	129.00	165.00	129.00	* 164.50	* 114.75
	Oats (producer's price) (²)	214.00	214.00	214.00	214.00	150.00	96.65	* 149.50	* 86.10
	Potatoes (Paris)	202.50	200.00	195.00	183.35	188.65	...	...	...
	Flax, scutched, from Brittany	2,400.00	2,400.00	2,400.00	2,400.00	*2,400.00	...	...	...
	Hay of natural meadows (producers' prices)	64.75	64.25	63.75	62.75	52.50	...	* 52.00	...
	Wheaten straw (producers' prices)	37.25	36.75	36.25	35.00	32.50	...	* 32.50	...
A II	Beef, dead weight, 1st quality (Paris)	1,800.00	1,800.00	1,800.00	1,800.00	1,724.00	1,588,35	1,648.00	* 1,340.00
	Mutton, dead weight, 1st quality (Paris)	2,800.00	2,800.00	2,800.00	2,800.00	2,244.00	2,103.00	2,279.00	* 1,975.00
	Pork, dead weight, 1st quality (Paris)	2,500.00	2,500.00	2,500.00	2,500.00	2,260.00	...	2,119.00	...
	Dairy butter (Paris)	4,200.00	4,200.00	4,200.00	4,012.50	3,300.00	...	3,271.00	...
	Cheese, Gruyère (Paris)	2,520,00	2,520.00	2,520.00	2,250.00	2,150.00	...	*2,175.00	...
	Eggs (Paris) per 100	182.00	176.00	176.00	173.30	135,00	...	125.05	...

(*) Indicates that the product was not quoted during part of the period under review. – n. q. = *not quoted*. – n. *nominal*.

(¹) As from January 1941: cheese with 20 % fat. — (²) Agricultural year 1939-40: price at Paris market; as from October 1939 free in Département of production.

ITALY (Prices in lire per quintal).

Groups	Description	Average March 1942	Average Feb. 1942	Average Jan. 1942	Average Oct.-Dec. 1941	Average Jan. March 1941	Average Jan. March 1940	Agricultural year (1) 1940-41	Agricultural year (1) 1939-40
A I	Wheat, soft (producer's price)	175.00	175.00	175.00	175.00	155.00	135.00	157.90	135.00
	Wheat, hard (producer's price)	190.00	190.00	190.00	190.00	170.00	150.00	172.90	150.00
	Rye (producer's price) (1)	166.00	166.00	166.00	166.00	136.00	131.90	136.00	125.95
	Barley (producer's price) (2)	161.00	161.00	161.00	161.00	130.00	140.00	134.20	133.45
	Oats (producer's price) (3)	n. q.	n. q.	n. q.	148.35	135.00	147.50	* 135.00	136.35
	Maize (producer's price)	120.00	135.00	135.00	135.00	120.00	* 108.00	118.00	* 108.00
	Rice, rough, Maratelli (producer's price)	159.95	159.25	158.55	157.00	142.00	114.65	136.00	113.25
	Rice, Maratelli (f.o.r. rice-mill) (4)	216.00	216.00	216.00	215.30	214.25	210.95	215.35	207.65
	Hemp, fibre	710.00	710.00	710.00	710.00	710.00	590.00	670.00	590.00
	Olive oil, fine (producer's price)	1.460.00	1,460.00	1.460.00	1,460.00	877.00	782.00	857.40	* 790.10
A II	Oxen, live weight, 1st quality (Milano)	...	* 503.35	522.00	525.90	537.85	515.00	549.30	518.25
	Lambs, dead weight (Roma)	1,630.00	1,630.00	1.630.00	1,653.35	1,045.65	869.40	*1,051.15	838.30
	Pigs, 400 lb. and more, live weight (Milano)	1,080.00	1,080.00	1,080.00	1,080.00	n. 840.00	700.00	820.00	697.00
	Cheese, Parmigiano-Reggiano	1,540.00	1,520.00	1,500.00	*1,500.00	1,325.00	1,125.00	*1,376.00	*1,215.00
	Eggs (Milano) per 100	150.85	150.85	142.90	135.00	87.55	72.60	90.50	64.40
	Wool, « Roma 2, Vissana » (producer's price)	3,274.00	3,274.00	3,274.00	3,274.00	3.141.00	2,602.00	3,156.50	2,646.90
B I	Superphosphate of lime, 14–16 % (Milano) (4)	...	38.20	38.20	38.20	30.20	n. q.	29.90	* 26.90
	Chloride of potash, 50 % (Milano) (4)	...	82.60	82.60	82.60	82.60	77.90	82.60	76.55
	Nitrate of lime, 15–16 % (Milano) (4)	...	119.55	119.30	116.00	116.80	n. q.	114.15	* 100.90
	Sulphate of ammonia, 20–21 % (Milano) (4)	...	112.00	111.00	108.90	109.25	n. q.	107.15	* 95.55
	Cyanamide of calcium, 15–16 % (Milano) (4)	...	128.15	126.95	123.85	117.60	n. q.	115.20	* 102.20
B II	Wheaten bran (at mill) (4)	62.85	62.85	62.85	62,85	62.85	61.65	62.85	61.10
	Rice-bran (at rice-mill) (4)	93.00	93.00	93.00	93.00	83.00	81.75	83.00	81.20
	Linseed cake (at oil-mill)	90.00	90.00	90.00	90.00	90.00	81.00	90.00	83.25
	Groundnut cake (at oil-mill)	75.00	75.00	75.00	75.00	75.00	65.00	75.00	67.50
	Rapeseed cake (at oil-mill	42.00	42.00	42.00	42.00	42.00	36.00	42.00	37.50

NETHERLANDS (Prices in florins per quintal).

Groups	Description	Average March 1942	Average Feb. 1942	Average Jan. 1942	Average Oct.-Dec. 1941	Average Jan. March 1941	Average Jan. March 1940	Agricultural year (1) 1940-41	Agricultural year (1) 1939-40
A I	Wheat (producer's price)	13.62	13.60	13.54	13.61	12.20	11.08	12.05	10.98
	Rye (producer's price)	13.12	13.10	13.04	13.11	11.20	9.29	10.94	* 9.38
	Barley (producer's price)	11.87	11.85	11.79	11.86	10.70	9.00	10.33	* 9.00
	Oats (producer's price)	9.87	9.85	9.79	9.86	9.20	8.00	8.91	* 8.00
	Dry peas, green (producer's price)	15.37	15.35	15.29	15.36	13.20	9.75	12.54	* 9.75
	Rapeseed (producer's price)	20.75	20.70	20.58	20.31	17.20	15.00	16.90	* 15.00
	Linseed (producer's price)	15.75	15.70	15.58	15.31	14.70	10.00	* 14.63	* 10.00
	Potatoes (Amsterdam)	5.90	5.90	5.90	5.90	6.02	5.03	5.80	* 4.45
A II	Oxen, live weight (Rotterdam) (5)	63.00	63.00	63.00	63.00	63.00	81.67	* 63.00	78.92
	Pigs, live weight (Rotterdam)	71.00	71.00	71.00	71.33	70.00	62.67	69.00	60.50
	Milk, for industrial purposes (6)	10.50	10.50	10.50	9.10	7.47	...	7.12	...
	Butter, price for home consumption	230.00	230.00	230.00	230.00	195.00	161.42	183.00	151.00
	Cheese, Edam 40 + (Alkmaar)	112.00	112.00	112.00	112.00	70.50	45.87	69.28	42.18
	Eggs, fresh (producer's price) (7)	...	105.00	105.00	105.00	105.00	80.66	* 105.00	75.00
B I	Superphosphate, 14 % (Zwolle) (8)	3.90	3.90	3.90	3.90	4,67	2.28	* 4.44	2.17
	Kainite, 14 % (Zwolle)	1.93	1.90	1.87	1.83	1.74	1.70	1.71	1.67
	Sulphate of ammonia, 20 % (Zwolle)	7.25	7.30	7.20	6.93	6.33	5.67	6.18	5.54
B II	Linseed cake, Dutch (Rotterdam)	n. q.	n. q.	n. q.	* 12.25	12.25	8.75	10.65	* 8.51
	Meadow hay, 1st quality (producer's price)	5.85	5.85	5.85	5.35	5.30	...	5.30	...
	Straw, all sorts, pressed (producer's price)	2.09	2.07	2.05	2.02	2.05	...	* 2.04	...

* Indicates that the product was not quoted during part of the period under review. — n. q. = *not quoted.* — n. = *nominal.*

(1) Agricultural years 1939-40 and 1940-41: price at Milan market. — (2) Before October 1940: price at Milan market. — (3) Agricultural year 1939-40: price at Milan market. — (4) Including the 2 per cent. sales tax, levied as from February 8, 1940. — (5) Before Oct. 1940: beef, dead weight. — (6) Before July 1941: Price at farm in Friesland for milk with 3.3 % butter-fat. — (7) Before Nov. 1940: price at Barneveld market. — (8) As from Jan. 1941: superphoshate 17 %.

Groups	Description	Average: March 1942	Feb. 1942	Jan. 1942	Oct.-Dec. 1941	Jan.-March 1941	Jan.-March 1940	Agricultural year 1940-41	Agricultural year 1939-40
	SWEDEN (Prices in Swedish crowns per quintal)								
A I	Wheat (producer's price)	27.00	27.00	27.00	27.00	25.66	20.51	25.26	* 19.79
	Rye (producer's price)	27.00	27.00	27.00	27.00	25.66	20.48	25.22	* 19.63
	Barley (producer's price)	26.00	26.00	26.00	26.50	25.00	17.71	* 24.43	* 16.50
	Oats (producer's price)	22.50	22.50	22.50	23.00	22.16	17.16	* 22.32	* 16.15
	Dry peas, yellow (producer's price)	50.00	50.00	50.00	50.00	52.75	40.00	* 47.29	* 37.64
	Potatoes, 1st quality (Stockholm)	19.32	18.98	15.73	12.74	12.21	14.21	* 11.12	* 12.68
A II	Beef, of cow and oxen (Stockholm)	182.00	182.00	182.00	182.00	157.20	125.00	151.21	128.40
	Pork (Stockholm)	209.00	209.00	209.00	208.00	192.66	152.58	191.07	152.41
	Butter (Malmö; prices for the home market)	405.00	405.00	405.00	393.66	405.00	300.00	369.08	300.00
	Eggs (Stockholm) (producer's price)	...	...	...	258.67	215.83	154.17	192.46	150.46
B I	Superphosphate, 20 %	...	...	...	10.00	10.05	9.80	9.95	* 8.62
	Potash salts, 40 %	...	...	...	15.60	15.60	15.60	15.38	14.62
	Nitrate of lime, 15 ½ % (1)	...	...	...	20.25	20.75	18.90	19.67	* 16.81
B II	Wheaten bran	16.50	16.50	16.50	16.50	16.50	17.05	16.67	15.63
	Rye bran	16.50	16.50	16.50	16.50	15.50	15.67	15.67	14.60
	Feeding cellulose	12.00	12.00	12.00	12.00	18.00	—	* 17.91	—
	Concentrated feeding mixture 48 % (2)	28.00	28.00	28.00	* 28.00	23.50	23.50	23.50	23.10
	Meadow hay, good quality (producer's price)	18.00	18.00	18.00	18.00	24.00	9.34	* 22.86	* 9.07
	Wheaten straw, good quality (producer's price)	6.00	6.00	6.00	6.00	7.00	2.50	* 6.65	* 2.91

* Indicates that the product was not quoted during part of the period under review. — n. q. = *not quoted.* — n. = *nominal.*
(1) As from July 1941: calcium cyanamide 18 %. — (2) As from October 1941: concentrated feeding mixture 45 %.

PRICES OF CEREALS OF THE 1941 CROP

Belgium. — All the quantities of *wheat, rye, spring* and *winter barley* which farmers are not allowed to keep for their own needs, must be delivered before the end of February 1942.

Bulgaria. — The base price of *maize* which had been set at 400 levas per quintal, was reduced 30 levas during the period October 1941-January 1942 and 10 levas in February and March 1942.

Finland. — All quantities of *cereals* which farmers are not allowed to keep for their own needs, must be delivered before the end of January 1942. During the month of February, farmers may deliver amounts which are not obligatory and for which they will be paid a supplement of 25 finmarks per quintal. Beginning with the month of March, cereals will be requisitioned against payment of 25 finmarks below the base price.

France. — Deliveries of *wheat* and *rye* must be made by the end of May. After that date prices will be reduced as follows: 270 instead of 300 francs per quintal of wheat, and 220 instead of 244 francs per quintal of rye.

For *barley* and *oats* it is prescribed that two thirds of the quantities the delivery of which is obligatory, must be delivered in the second part of February, and one third in the second part of April.

All quantities of *maize* which have to be delivered must be passed to the collecting agents before the end of May.

All prices of *cereals* indicated as the amount to be paid henceforth to farmers, must be reduced by 6 francs per quintal. This sum is to be deposited in the new Fonds National de Solidarité Agricole created in favour of the application of the social agricultural laws.

Hungary. — The maximum price of unbearded *barley* to be paid to producers had been set separately by a decree of July 5, 1941. The base price was to be 32 pengö per quintal. Beginning with the month of September, this price would be increased 0,20 pengö monthly. The price to be paid in March was therefore 33,40 pengö. A new decree dated March 6, abolishes all preceding regulations and sets the maximum price at 50 pengö for the rest of the season.

Italy. — The daily bread ration was reduced by a ministerial decree of March 13. Consequently also the amount of *wheat* and of *maize* which farmers have the right to keep for their own use has been reduced. In order to receive the premium for " prompt delivery " (15 lire per quintal) farmers must deliver these new surpluses before the end of April, in as far as wheat, and before the end of May in as far as maize is concerned.

Rumania. — The period during which prompt delivery premiums for *wheat* (200 lei per quintal) and *barley* (150 lei per quintal) would be paid, has been prolongated to March 15, 1942. Obligatory delivery to the State, or to bodies indicated by the State, has been extended to *maize*. Farmers who have sown less than 2 hectares of maize are exempt from this obligation. Each agricultural holding can sell freely up to 10 quintals of maize.

Turkey. — The following prices, with a retroactive effect as from December 10, 1941, are now in force:

wheat	13.5	Turkish	pounds	per quintal
rye and *barley*	11.0	»	»	»
oats and *meslin*	11.5	»	»	»

CEREAL PRICES IN CONTINENTAL EUROPE DURING THE LAST THREE YEARS, II

by J.P. van Aartsen

In the January issue, pp. 39-48, of this *Bulletin* we surveyed the development of maximum, minimum and fixed prices, due to farmers during the seasons 1939-40, 1940-41 and 1941-42. The five tables reproduced in that article and the information contained in the text, show that in almost all countries under review, these prices were subject to sometimes very considerable increases in the course of these last years.

The world crisis had a serious influence on the development of prices, and nearly all countries had attempted to help farmers by measures aiming either at reducing the cost price, or (and this measure was easier and thus more frequently recurred to) increasing the sale price. Before the beginning of the present war, some countries had adopted more radical measures, while

Wheat and Rye. — *Producer's prices, expressed in the currencies of the countries concerned, per 100 kg.*

(Figures in italics refer to market prices).

Country and currency	Sept. 1939	Jan. 1940	April 1940	Sept. 1940	Jan. 1941	April 1941	Sept. 1941	Jan. 1942	April 1942
	Prices per 100 kg.								
Wheat.									
Germany (RM.)	19.80	20.60	21.20	19.80	20.60	21.20	20.40	20.80	20.80
Belgium (francs)	*120.40*	*147.75*	*156.00*	170.00	170.00	170.00	220.00	201.00	n. q.
Bulgaria (levas)	350.00	350.00	350.00	430.00	430.00	430.00	620.00	620.00	620.00
Denmark (crowns)	18.00	18.30	18.60	28.00	28.00	28.00	28.00	28.00	28.00
Spain (pesetas)	59.70	62.10	63.40	84.00	83.50	83.00	94.00	83.00	n. q.
Finland (finmarks)	290.00	290.00	290.00	294.00	294.00	294.00	340.00	340.00	340.00
France (francs)	192.50	198.50	203.00	214.75	229.75	n. 229.75	300.00	300.00	300.00
Hungary (pengö)	19.95	20.55	20.75	25.70	26.30	26.50	30.00	27.00	27.00
Italy (lire)	135.00	135.00	135.00	155.00	155.00	155.00	175.00	175.00	n. 175.00
Norway (crowns)	24.00	24.00	24.00	24.00	30.00	30.00	36.75	35.00	35.00
Netherlands (florins)	10.42	10.95	11.35	11.54	12.07	12.45	13.57	13.54	13.62
Portugal (escudos)	143.15	148.35	152.25	143.15	148.35	152.25	163.15	168.35	172.25
Rumania (lei)	430.00	420.00	420.00	757.00	857.00	857.00	1,100.00	1,300.00	1,100.00
Sweden (crowns)	*17.07*	*20.12*	*21.08*	*25.02*	27.00	25.00	27.00	27.00	27.00
Switzerland (francs)	36.00	36.00	36.00	42.00	42.00	42.00	45.50	45.50	45.50
Rye.									
Germany (RM.)	18.10	18.90	19.50	18.10	18.90	19.50	18.70	19.10	19.10
Belgium (francs)	[1]) * *123.50*	[2]) *133.50*	*140.50*	155.00	155.00	155.00	210.00	191.00	190.00
Bulgaria (levas)	300.00	300.00	300.00	375.00	375.00	375.00	520.00	520.00	520.00
Denmark (crowns)	19.00	19.30	19.60	29.00	29.00	29.00	29.00	29.00	29.00
Spain (pesetas)	...	...	...	70.00	69.50	69.00	70.00	69.00	n. q.
Finland (finmarks)	285.00	285.00	285.00	285.00	285.00	285.00	340.00	340.00	340.00
France (francs)	*n. q.*	*154.00*	*145.00*	170.00	174.00	177.00	243.00	243.00	244.00
Hungary (pengö)	*14.12*	15.82	16.57	19.20	19.80	20.00	28.00	25.20	25.20
Italy (lire)	*117.80*	*128.75*	*133.45*	*136.00*	*136.00*	*136.00*	166.00	166.00	n. q.
Norway (crowns	22.00	22.00	22.00	22.00	28.00	28.00	36.75	35.00	35.00
Netherlands (florins)	9.00	9.15	9.55	10.54	11.07	11.45	13.07	13.04	13.12
Portugal (escudos)	*111.20*	*111.20*	*111.20*	*111.20*	*111.20*	*111.20*	113.10	118.30	122.20
Rumania (lei)	*319.00*	*400.00*	*585.00*	520.00	700.00	700.00	900.00	900.00	900.00
Sweden (crowns)	*16.48*	*20.27*	*21.09*	*24.91*	27.00	25.00	27.00	27.00	27.00
Switzerland (francs)	28.50	28.50	28.50	39.00	39.00	39.00	43.50	43.50	43.50

[1]) October. — [2]) February.

others left more liberty to those touched by the problem; but in all cases, regulations regarding at least wheat had been enacted. All these measures aimed at keeping the home price of cereals above the level of the free market. Among the measures taken by importing countries, must be mentioned import duties and other taxes on imported products; import quotas and prohibitions; consumption quotas—as for instance the obligatory use of a certain percentage of indigenous products in the making of bread, alimentary pastry and other food commodities; the obligatory purchase at a fixed price of certain quantities of indigenous cereals in the case of imports of similar products from abroad, etc.—credit facilitations for cereals voluntarily or compulsorily delivered to special storage houses; the purchase and storing, by special bodies supervised by the Government, of amounts which are not immediately needed for consumption; and lastly the monopolies either only on imports or also on purchases within the country and on the distribution of cereals. Most of these measures were of no use for exporting countries. In their case, market regulations, always aiming at increasing the producers' profits, amounted sometimes to an export monopoly or a monopoly regarding the buying up of all cereals

WHEAT and RYE. — *Producer's prices, reduced into gold-francs per 100 kg.*

(Figures in italics refer to market prices).

COUNTRY	Sept. 1939	Jan. 1940	April 1940	Sept. 1940	Jan. 1941	April 1941	Sept. 1941	Jan. 1942	April 1942	Percentage Sept. 1941	Percentage Jan. 1942	Percentage April 1942
	Prices in gold-francs per 100 kg.									Compared with corresponding month of 1939-40		
WHEAT.												
Germany	24.45	25.44	26.18	24.45	25.44	26.18	25.19	25.69	25.69	103.0	101.0	98.1
Belgium	*12.67*	*15.33*	*16.29*	16.80	16.80	16.80	21.74	19.86	n. q.	—	—	—
Bulgaria	13.18	13.18	13.18	16.20	16.20	16.20	23.36	23.36	23.36	177.2	177.2	177.2
Denmark	10.72	10.87	11.05	16.69	16.69	16.69	16.69	17.11	18.05	155.7	157.4	163.3
Spain	24.71	19.66	18.50	24.46	24.32	24.17	27.37	24.17	n. q.	110.8	122.9	—
Finland	18.09	18.09	18.09	18.41	18.41	18.41	21.29	21.29	21.29	117.7	117.7	117.7
France	13.48	13.75	12.51	14.88	14.19	n. 14.19	18.52	18.52	18.52	137.4	134.7	148.0
Hungary	15.35	15.81	15.97	19.78	19.74	19.89	22.51	20.26	20.26	146.6	128.1	126.9
Italy	21.84	21.84	21.84	25.08	25.08	25.08	28.42	28.42	28.42	130.1	130.1	130.1
Norway	16.79	16.79	16.79	16.84	21.05	21.05	25.79	24.56	24.56	153.6	146.3	146.3
Netherlands	17.03	17.94	18.55	18.91	19.78	20.40	22.24	22.19	22.32	130.4	123.7	120.3
Portugal	16.53	16.71	16.36	17.56	18.41	18.90	20.45	21.10	21.59	123.7	126.3	132.0
Rumania	13.11	10.58	10.58	19.08	21.60	21.60	27.72	32.76	27.72	211.4	309.6	262.0
Sweden	*12.51*	*14.75*	*15.45*	*18.39*	19.85	18.38	19.85	19.85	19.85	—	—	—
Switzerland	25.02	24.86	24.86	29.53	30.06	30.06	32.56	32.56	32.56	130.1	131.0	131.0
RYE.												
Germany	22.35	23.34	24.08	22.35	23.34	24.08	23.09	23.59	23.59	103.3	101.1	98.0
Belgium	[1] *12.74*	[2] *13.88*	*14.67*	15.31	15.31	15.31	20.75	18.87	18.77	—	—	—
Bulgaria	11.36	11.30	11.30	14.13	14.13	14.13	19.59	19.59	19.59	173.4	173.4	173.4
Denmark	11.31	11.46	11.64	17.28	17.28	17.28	17.28	17.72	18.70	152.8	154.6	160.7
Spain	...	...	...	20.38	20.24	20.09	20.38	20.09	n. q.	—	—	—
Finland	17.77	17.77	17.77	17.84	17.84	17.84	21.29	21.29	21.29	119.8	119.8	119.8
France	n. q.	*10.67*	*8.94*	11.78	10.74	10.93	15.01	15.01	15.07	—	—	—
Hungary	*10.87*	12.17	12.75	14.78	14.86	15.01	21.01	18.91	18.91	—	155.4	148.3
Italy	*19.06*	*20.83*	*21.59*	*22.00*	*22.00*	*22.00*	26.96	26.96	n. q.	—	—	—
Norway	15.39	15.39	15.39	15.44	19.65	19.65	25.79	24.56	24.56	167.6	159.6	159.6
Netherlands	14.72	14.99	15.61	17.27	18.14	18.76	21.42	21.37	21.50	145.5	142.6	137.7
Portugal	*12.84*	*12.52*	*11.95*	*13.64*	*13.80*	*13.80*	14.18	14.83	15.32	—	—	—
Rumania	*9.73*	*10.08*	*14.74*	13.10	17.64	17.64	22.68	22.68	22.68	—	—	—
Sweden	*12.08*	*14.86*	*15.46*	*18.31*	19.85	18.38	19.85	19.85	19.85	—	—	—
Switzerland	19.81	19.68	19.68	27.43	27.91	27.91	31.13	31.13	31.13	157.1	158.2	158.2

[1]) October. — [2]) February.

to be exported; in other cases legislation was limited at import prohibitions and at granting export premiums. Import or export prices could be influenced also by exchange manipulations (1).

Beginning with the month of September 1939, two important factors are to be considered: first, the limitation of international trade and, before all, the decrease of imports from overseas which has increased the necessity of a maximum production. This has brought Governments to encouraging production through the fixing of higher prices. This measure is quite different from the preceding one which, in most countries, was limited to avoiding heavy losses; a result which it has been tried even sometimes to obtain by reducing production. Besides, the course of the present war induces many countries towards a new equilibrium of their economy, which should take into consideration the European space and which includes, inter alia, the adaptation of

FODDER BARLEY and OATS. — *Producer's prices, expressed in the currencies of the countries concerned, per 100 kg.*

(Figures in italics refer to market prices).

COUNTRY AND CURRENCY	Sept. 1939	Jan. 1940	April 1940	Sept. 1940	Jan. 1941	April 1941	Sept. 1941	Jan. 1942	April 1942
	Prices per 100 kg.								
FODDER BARLEY.									
Germany (RM.)	16.60	17.40	17.80	16.60	17.40	17.80	16.60	17.40	17.80
Belgium (francs)	* *126.00*	[1] *170.75*	*170.00*	150.00	150.00	150.00	185.00	185.00	185.00
Bulgaria (levas)	*210.75*	*275.85*	*315.00*	340.00	340.00	340.00	380.00	380.00	380.00
Denmark (crowns)	17.00	17.30	17.60	25.00	25.00	25.00	25.00	25.00	25.00
Spain (pesetas)	...	...	...	56.50	56.00	55.50	51.50	50.50	n. q.
Finland (finmarks)	260.00	260.00	260.00	260.00	260.00	260.00	310.00	310.00	310.00
France (francs)	[2] *92.00*	*134.00*	*119.00*	160.00	164.00	199.00	229.00	229.00	229.00
Hungary (pengö)	16.80	17.92	18.62	20.25	21.40	22.00	24.50	24.50	24.50
Italy (lire)	*124.05*	*140.00*	*141.85*	*147.50*	130.00	130.00	161.00	161.00	n. q.
Norway (crowns)	20.00	21.23	22.00	22.00	26.00	26.00	32.75	31.00	31.00
Netherlands (florins)	9.00	9.00	9.00	10.04	10.57	10.95	11.82	11.79	11.87
Rumania (lei)	*325.00*	*420.00*	*455.00*	396.00	510.00	510.00	750.00	900.00	750.00
Sweden (crowns)	*14.31*	*17.68*	n. q.	*25.00*	25.00	23.00	27.00	26.00	26.00
Switzerland (francs)	...	...	...	38.00	38.00	38.00	40.50	40.50	40.50
OATS.									
Germany (RM.)	17.20	17.60	17.90	17.90	18.30	18.60	17.90	18.30	18.60
Belgium (francs)	*82.20*	*117.25*	*129.00*	145.00	145.00	145.00	180.00	180.00	180.00
Bulgaria (levas)	*265.00*	[1] *287.50*	[3] *285.00*	360.00	360.00	360.00	400.00	400.00	400.00
Denmark (crowns)	17.00	17.30	17.60	25.00	25.00	25.00	25.00	25.00	25.00
Spain (pesetas)	...	...	...	48.50	48.00	47.50	48.50	47.50	n. q.
Finland (finmarks)	250.00	250.00	250.00	260.00	260.00	260.00	260.00	260.00	260.00
France (francs)	[2] *62.35*	*97.00*	*100.00*	145.00	149.00	152.00	214.00	214.00	214.00
Hungary (pengö)	*19.22*	*20.10*	*20.80*	21.50	21.70	22.30	26.50	26.50	26.50
Italy (lire)	*107.50*	*147.50*	*151.25*	135.00	135.00	135.00	151.00	n. q.	n. q.
Norway (crowns)	19.00	19.00	19.00	19.00	23.00	23.00	29.75	28.00	28.00
Netherlands (florins)	8.00	8.00	8.00	8.54	9.07	9.45	9.82	9.79	9.87
Rumania (lei)	*402.00*	*507.00*	*590.00*	412.00	530.00	530.00	700.00	700.00	700.00
Sweden (crowns)	*13.21*	*15.61*	*18.45*	*22.73*	22.50	21.50	23.50	22.50	22.50
Switzerland (francs)	...	...	...	37.00	37.00	37.00	40.00	40.00	40.00

1) February. — 2) August. — 3) March.

(1) For the years 1935 to 1937 these measures have been dealt with in detail in the quarterly publication of the Institute *Government measures affecting agricultural prices;* see, furthermore, *The world agricultural situation, economic commentary on the International yearbook of agricultural statistics,* and, as from 1938, the *International chronicle of agriculture,* published in the *Monthly bulletin of agricultural economics and sociology.*

cereal prices to the level ruling in countries with self-sufficiency tendencies where these prices were higher than generally elsewhere.

The consequences of these two parallel influences or, in some rare cases, the consequence of the first one only are clearly shown in the tables published in our first article. These prices should be slightly modified, if due account is taken of further information which reached the Institute after the month of January and is given separately at pp. 180-181 of this Bulletin.

In order to even more clearly show these tendencies, we give in the following tables a summary for some typical months of the prices contained in the January issue of the Crop Report, taking into due account the modifications which have been introduced. Tables will, furthermore, be found containing these prices in gold-francs, the value of which has been calculated, as far as possible, through the official exchange quotations of national curriences at Berlin, which have been converted on the basis of 1 RM = 1,235 gold-francs. Only for Spain it has been necessary to use New York quotations for the year 1939 and for France calculations regarding the period September 1939–August 1940

FODDER BARLEY and OATS. — *Producer's prices, reduced into gold-francs per 100 kg.*

(Figures in italics refer to market prices).

COUNTRY	Sept. 1939	Jan. 1940	April 1940	Sept. 1940	Jan. 1941	April 1941	Sept. 1941	Jan. 1942	April 1942	Percentage Sept. 1941	Percentage Jan. 1942	Percentage April 1942
	Prices in gold-francs per 100 kg.									Compared whith corresponding month of 1939-40		
FODDER BARLEY												
Germany	20.50	21.49	21.98	20.50	21.49	21.98	20.50	21.49	21.98	100.0	100.0	100.0
Belgium	[*] *13.26*	[1] *17.76*	*17.76*	14.82	14.82	14.82	18.28	18.28	18.28	—	—	—
Bulgaria	*7.94*	*10.39*	*11.87*	12.81	12.81	12.81	14.31	14.31	14.31	—	—	—
Denmark	10.12	10.28	10.45	14.90	14.90	14.90	14.90	15.27	16.12	147.2	148.5	154.3
Spain	...	...	...	16.45	16.31	16.16	15.00	14.71	n. q.	—	—	—
Finland	16.22	16.22	16.22	16.28	16.28	16.28	19.41	19.41	19.41	119.7	119.7	119.7
France	[2] *7.42*	*9.28*	*7.33*	11.08	10.13	12.29	14.14	14.14	14.14	—	—	—
Hungary	12.93	13.79	14.33	15.58	16.06	16.51	18.39	18.39	18.39	142.2	133.4	128.3
Italy	*20.07*	*22.65*	*22.95*	*23.86*	21.03	21.03	26.15	26.15	n. q.	—	—	—
Norway	13.99	14.85	15.39	15.44	18.24	18.24	22.98	21.75	21.75	164.3	146.5	141.3
Netherlands	14.72	14.74	14.71	16.45	17.32	17.95	19.37	19.32	19.45	131.6	131.1	132.2
Rumania	*9.91*	*10.58*	*11.47*	9.98	12.85	12.85	18.90	22.68	18.90	—	—	—
Sweden	*10.49*	*12.96*	n. q.	*18.38*	18.38	16.91	19.85	19.11	19.11	—	—	—
Switzerland	...	...	...	26.72	27.20	27.20	28.99	28.99	28.99	—	—	—
OATS												
Germany	21.24	21.74	22.11	22.11	22.60	22.11	22.11	22.60	22.97	104.1	104.0	103.9
Belgium	*8.65*	*12.16*	*13.48*	14.33	14.33	14.33	17.78	17.78	17.78	—	—	—
Bulgaria	*9.98*	[1] *10.83*	[3] *10.74*	13.56	13.56	13.56	15.07	15.07	15.07	—	—	—
Denmark	10.12	10.28	10.45	14.90	14.90	14.96	14.90	15.27	16.12	147.2	148.5	154.3
Spain	...	...	...	14.12	13.98	13.83	14.12	13.83	n. q.	—	—	—
Finland	15.59	15.59	15.59	16.28	16.28	16.28	16.28	16.28	16.28	104.4	104.4	104.4
France	[1] *5.03*	*6.72*	*6.16*	10.05	9.20	9.39	13.21	13.21	13.21	—	—	—
Hungary	*14.79*	*15.47*	*16.01*	16.55	16.29	16.74	19.89	19.89	19.89	—	—	—
Italy	*17.39*	*23.86*	*24.47*	21.84	21.84	21.84	24.52	n. q.	n. q.	—	—	—
Norway	13.29	13.29	13.29	13.33	16.14	16.14	20.88	19.65	19.65	157.1	147.9	147.9
Netherlands	13.09	13.10	13.08	14.00	14.86	15.49	16.09	16.04	16.18	122.9	122.4	123.7
Rumania	*12.26*	*12.78*	*14.87*	10.38	13.36	13.36	17.64	17.64	17.64	—	—	—
Sweden	*9.68*	*11.44*	*13.52*	*16.71*	16.54	15.80	17.27	16.54	16.54	—	—	—
Switzerland	...	...	...	26.02	26.48	26.48	28.63	28.63	28.63	—	—	—

([1]) February. — ([2]) August. — ([3]) March.

MAIZE. — *Producer's prices, expressed in the currencies of the countries concerned, per 100 kg.*

(Figures in italics refer to market prices).

COUNTRY AND CURRENCY	Sept. 1939	Jan. 1940	April 1940	Sept. 1940	Jan. 1941	April 1941	Sept. 1941	Jan. 1942	April 1942
	Prices per 100 kg.								
Bulgaria (levas)	250.00	250.00	250.00	300.00	300.00	300.00	400.00	370.00	400.00
Spain (pesetas)	53.16	55.44	56.63	70.00	69.50	69.00	70.00	69.00	n. q.
Hungary (pengö)	*18.85*	*20.67*	*22.35*	n. q.	20.60	22.80	18.70	21.00	22.90
Italy (lire)	n. q.	108.00	108.00	120.00	120.00	120.00	135.00	135.00	135.00
Portugal (escudos)	*104.25*	*104.25*	*104.25*	114.80	114.80	114.80	115.00	120.00	120.00
Rumania (lei)	*357.00*	*341.00*	434.00	480.00	520.00	520.00	720.00	900.00	900.00

have been made on the basis of the Swiss franc. In the case of Hungary and Rumania, courses have been fixed through special payment agreements, in which are established fixed prices for the purchase by banks authorised in the two countries mentioned of reichsmarks offered by the exporters.

MAIZE. — *Producer's prices, reduced into gold-francs, per 100 kg.*

(Figures in italics refer to market prices).

COUNTRY	Sept. 1939	Jan. 1940	April 1940	Sept. 1940	Jan. 1941	April 1941	Sept. 1941	Jan. 1942	April 1942	Percentage Sept. 1941	Percentage Jan. 1942	Percentage April 1942
	Prices in gold-francs per 100 kg.									Compared with corresponding month of 1939-40		
Bulgaria	9.42	9.42	9.42	11.30	11.30	11.30	15.07	13.94	15.07	160.0	148.0	160.0
Spain	22.01	17.56	16.53	20.38	20.24	20.09	20.38	20.09	n. q.	92.6	114.4	—
Hungary	*14.51*	*15.91*	*17.20*	n. q.	15.46	17.11	14.03	15.76	17.19	—	—	—
Italy	n. q.	17.47	17.47	19.41	19.41	19.41	21.92	21.92	21.92	—	125.5	125.5
Portugal	*12.04*	*11.74*	*11.20*	14.08	14.25	14.25	14.42	15.04	15.04	—	—	—
Rumania	*10.88*	*8.59*	10.94	12.10	13.10	13.10	18.14	22.68	22.68	—	—	207.3

The tables show that there are still considerable differences, which are particularly evident in the case of countries whose economies have remained more independent of those of Germany and Italy, or whose natural conditions are quite different from those ruling there. In Switzerland these two factors coincide. The production of cereals in that country, which is mostly mountainous, is very expensive. In the exporting countries Bulgaria and Rumania the production of bread-making cereals has been encouraged to the detriment of that of fodder cereals, very high prices for the former being possible thanks to the concentration of all market activity in the hands of special institutions supervised by the State. The Netherlands and Norway show an adjustment to the German level which is already quite considerable.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country: Germany, Bohemia and Moravia (Protectorate); Hungary: 1 = excellent, 2 = good, 3 = average, 4 = poor, 5 = very poor; Finland: 8 = very good, 6 = above the average, 5 = average; France: 100 = excellent, 70 = good, 60 = fairly good, 50 = average, 30 = poor; Romania and Sweden: 5 = excellent, 4 = good, 3 = average, 2 = poor, 1 = very poor; Netherlands: 90 = excellent, 70 = good, 60 = fairly good, 50 = below awerage; Portugal: 100 = excellent, 80 = good, 60 = average, 40 = poor, 20 = very poor; Switzerland: 100 = excellent, 90 = very good, 75 = good, 60 = fairly good, 50 = average, 40 = rather poor, 30 = poor, 10 = very poor; U.S.S.R.: 5 = good, 4 = above the average, 3 = average, 2 = below average, 1 = poor; Canada: 100 = crop condition promising a yield equivalent to the average yield of a long series of years; United States: 100 = crop condition which promises a normal yield; Egypt: 100 = crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed: 100 = crop condition which promises a yield equal to the average of the last ten years.

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

VEGETAL PRODUCTION

UKRAINE AND WORLD AGRICULTURAL PRODUCTION (1)

by I. GRINENCO

In a broad way, it can be said that Ukrainian agricultural production was an important element in war economy even during the first world war, particularly in its last stage. In the present war, after the breaking of the conflict between Germany and Soviet Union, the agricultural resources of Ukraine have acquired an even greater importance in the plans of war economy. We believe therefore that an exposition of statistical data which may allow us to show the fundamental lines of the evolution of agricultural production in Ukraine from 1913 to the eve of the German-Soviet conflict, may be of great interest in the present circumstances.

Territory and population.

Although the area of Ukraine is over 172,000 square miles, and therefore one of the largest European countries, it represents only 2 per cent. of the territory of the Soviet Union. At the beginning of 1939 its population numbered 30,960,221

(1) The statistical data concerning Ukraine were drawn from Soviet official publications, and refer to the Territory in 1938, i. e., without Bessarabia, Northern Bukovina and Eastern Galicia incorporated in the Ukrainian Republic in 1940.

inhabitants, viz., a little over 18 per cent. of the whole population of the Union. Its density per square mile amounted to 180.1 inhabitants, i. e., slightly below that of France and a little above that of Romania. The distribution of the whole population between rural and urban was as follows:

I. — *Distribution of the total population of Ukraine in urban and rural.*

Years	Total population	Density per square Mile	Urban population	Rural population
1897	21,246,100	123.6	3,475,700	17,770,400
1914	26,748,000	155.6	—	—
1926	29,042,934	169.8	5,373,553	23,669,381
1939	30,960,221	180.1	11,195,620	19,764,601

Leaving the data of the year 1926 aside, inasmuch as they refer to a time when the social-economic adjustment of Ukraine had not yet been completed, let us compare the data of the years 1897 and 1939. It will be seen that during this period the total population increased nearly 46 per cent.; but while the urban population was almost trebled, the rural population remained well nigh stationary showing only an 11 per cent. increase, so that the proportion of rural population from almost 84 per cent., went down to 64 per cent. The problem of rural population in Ukraine is undoubtedly very complex. It must not be forgotten that, before the first great war, emigration from Ukraine, fed chiefly by rural elements, had been very important, reaching its maximum in 1909 with a difference of 236,000 persons between emigrants and immigrants. In the following years, this number went on decreasing, and in 1928,—the last year for which data are available—it amounted to a little over 37,000 people. If from 1918 on, emigration was not always due to economic reasons, in the preceding period the exodus of the rural population from Ukraine was the result of overcrowding in the country and of the insufficiency of the land at the disposal of the poorer classes of farmers. On the other hand, the surplus rural population of Ukraine could not find work in the industrial parts of its own country, which, at that time, was very little developped. Rural emigration was chiefly directed towards the most fertile regions of Siberia and Central Asia.

Agricultural exploitation of the territory.

The data on the agricultural exploitation of the Ukrainian territory are sufficiently detailed, cover a long series of years, are comparable between themselves, and therefore they are such as to allow us to trace the fundamental characteristics of Ukrainian agriculture and its modifications during the time between the first and the second world war.

The soil of the country, chiefly constituted by the black lands, is among the most fertile and therefore of the best suited for agricultural purposes. The same

cannot be said of the climate in the steppe zones where weather changes and rainfalls, especially in the southeastern part, are seriously perturbing elements. There, the most important task of agricultural rationalization consists in insuring to the soil the greatest possible amount of humidity, through suitable works and crop rotations as well as through the spreading of cultures which both on account of their vegetative cycle and other properties, may promise less uncertain results.

The distribution of the Ukrainian territory, as shown in the following Table, puts the proper light on some of its chief characteristics:

II. — *Distribution of territorial area in Ukraine.*

Classification	Thousand acres	Percentages
Area appertaining to farm houses	*7,912.4*	7.1
of which		
Fruit gardens and vineyards	(491.7)	
Kitchen gardens	(4,635.8)	
Fruit gardens and vineyards not appartaining to farm houses	*1,504.9*	1.4
Fruit gardens and vineyards	(469.5)	
Kitchen gardens	(1,035.4)	
Arable land	*70,408.8*	64.0
Permanent meadows.	*4,658.0*	4.2
of which		
River meadows	(1,831.1)	
Dry meadows	(1,369.0)	
Swampy meadows	(1,430.8)	
Pastures	*4,712.4*	4.3
of which		
Steppe land	(1,272.6)	
Mountain	(986.0)	
Forests	*8,384.4*	7.6
Brush	*884.7*	0.8
Marsh	*1,811.3*	1.7
Other land	*9,753.4*	8.9
Total Area	110,030.3	100.0

One is struck, first of all, by the very low percentage of forests and brushwood which amount to only 8.4 per cent. This is one of the lowest percentages in Europe, only slightly above that of the Netherlands (7.4 per cent); while, to mention the nearest countries alone, the proportion of forests is as high as 11.9 per cent. in Hungary, and about 21 per cent. in Poland and Romania. The percentage of natural meadows and pastures is hardly 8.5 per cent. i. e., one of the lowest in Europe. On the contrary the proportion of arable land, enclosures, orchards and vinyards outside enclosures, amounts to 72.5 per cent. and in this respect Ukraine holds the first place. Among the arable lands are

about 7.4 million acres of fallow land which in the steppe zones is indispensable to keep crops better and more steady.

The place of Ukraine in world agricultural production is already clearly indicated by the percentage of its total sown area (18.7 per cent. in 1938) compared with that of the Soviet Union.

The most important part of the sown area is to cereals (1), which in 1938 covered, altogether, 43,903,000 acres. Taking the area to cereals as a basis, the chief cereal producing countries in the world are classed in the following order:

III. — *Area and production of cereals in the most important cereal producing countries.*

COUNTRY	Years	Area of cereals (thousand acres)	Total production of cereals (thousand centals)
U. S. S. R. (including Ukraine)	1937	258,093	2,651,949
U. S. S. R. (excluding Ukraine)	1937	213,134	2,149,955
United States	1938	215,783	2,424,041
India	1938	185,474	1,574,160
Canada	1938	45,851	422,837
Ukraine	1937	44,957	501,994
Argentina	1938-39	42,132	344,694
Poland	1938	28,894	310.500
Germany (Territory within 1937 boundaries)	1938	28,175	581.656
Romania	1938	27,854	260,212
France	1938	25,657	403,505
Spain	1935	20,480	188,665
Turkey	1938	18,113	183,888
Italy	1937	17,053	292,120
Australia	1937-38	16,151	130,410
Yugoslavia	1938	15,286	195,690
Burma	1938	13,238	156,628
Japan	1938	12,543	339,989
Hungary (Territory within 1937 boundaries)	1938	10,178	159,022
Czechoslovakia	1938	8,730	150,340
Bulgaria	1938	6,862	76,567

As regards area sown to cereals, Ukraine occupies fifth place after the United States, the U. S. S. R. without Ukraine, India, and Canada, and is immediately followed by Argentina and all the other countries shown in the Table. Canada, Ukraine and Argentina sow to cereals almost the same acreage.

The comparison between the production data of a single year is less sure. Yet it can be said that even in the size of crops, Ukraine occupies one of the most important places, between Canada and Argentina. Among the European countries, only Germany (within the old boundaries of 1937) shows a greater

(1) In the statistics of the U. S. S. R., grain leguminous plants are included among cereals, although they represent only a small part of the total sown area.

production than Ukraine. France comes nearer it, while the other important cereal producing countries, such as Poland, Italy, Romania and Hungary show considerably lower figures.

Having thus determined the position of Ukraine in world production of cereals, we will now attempt to show the most important changes which Ukraine underwent in the exploitation of its agricultural land. For this purpose we have gathered in the following Table the data on the distribution of total sown area among the principal groups of crops, in 1913 and 1938, comparing them also with the corrisponding figures referring to the rest of the territory of the U. S. S. R.

IV. — *Changes in the distribution of sown areas in the U. S. S. R. (without Ukraine) and in Ukraine from 1913 to 1938.*

Classification	U. S. S. R. (without Ukraine)		Increase or decrease (—)		Ukraine		Increase or decrease (—)	
	1913 (000 acres)	1938 (000 acres)	(000 acres)	Per cent.	1913 (000 acres)	1938 (000 acres)	(000 acres)	Per cent.
Cereals	181,991.1	209,163.9	27,172.8	14.9	51,177.0	43,902.9	— 7,274.1	— 14.2
Industrial crops	9,249.0	21,149.3	11,900.3	128.7	1,995.7	5,932.6	3,936.9	197.3
Patatoes and green vegetables	7,410.6	17,999.9	10,589.3	142.9	2,017.9	5,192.3	3,174.4	157.3
Feed crops	3,826.7	26,693.7	22,867.0	597.6	1,240.2	8,153.3	6,913.1	557.4
Other crops	411.4	130.0	— 281.4	— 68.4	141.3	80.8	— 60.5	42.8
Total	202,888.8	275,136.8	72,248.0	35.6	56,572.1	63,261.9	6,689.8	11.8

The total area sown in the U. S. S. R. (without Ukraine) from 1913 to 1938 increased 35.6 per cent. The increase in Ukraine was only 11.8 per cent. As regards cereals, during the period under consideration, while in the rest of the U. S. S. R. the area increased 14.9 per cent. in Ukraine there was a decrease of 14.2 per cent. As regards industrial crops, Ukraine registered a far bigger increase than the other territories of the U. S. S. R., and precisely 197.3 per cent. against 128.7 per cent. The increase of potatoes and green vegetables was almost the same: 157.3 in Ukraine, and 142.9 per cent. in the rest of the U. S. S. R. Finally, the area sown to forage crops increased about 7 times in the U. S. S. R. and 6.6 times in Ukraine.

Consequently, considerable changes took place between 1913 and 1938 in the relative importance of the single groups of crops in Ukraine and in the other territories of the U. S. S. R. respectively.

While in 1913 cereal crops occupied nearly 9/10 of the total sown area in both countries (which is an evidence of the extreme prevalênce of the culture of cereals over all the other cultures), in 1938 the proportion of area to cereals fell to 76 per cent. in the U. S. S. R. without Ukraine, and to 69.4 per cent. in Ukraine. The percentage compared with arable lands (sown and fallow lands) would result even lower, and would probably be around 63 per cent. In order to

measure the progress made by Ukraine in agriculture, it will be enough to say that, in the same year the percentage of areas sown to cereals (as compared with the total of arable land) in Yugoslavia and Romania, was 83, it was 73 in Hungary, while in Poland it was 63 per cent. and in Germany, within the boundaries of 1937, it was about 60 per cent. The decrease of areas to cereals is accompanied by an increase of areas to all the other cultures, especially fodder crops, industrial crops and finally potatoes and green vegetables.

V. — *Proportional distribution in per cent. of sown acreage in the U. S. S. R. (without Ukraine) and in Ukraine.*

Classification	U. S. S. R. without Ukraine		Ukraine	
	1913	1938	1913	1938
Cereal crops	89.7	76.0	90.5	69.4
Industrial crops	4.6	7.7	3.5	9.4
Potatoes and green vegetables	3.6	6.5	3.6	8.2
Feed crops	1.9	9.7	2.2	12.9
Other crops	0.2	0.1	0.2	0.1
Total	100.0	100.0	100.0	100.0

With such big changes in the structure of its crops between 1913 and 1938, Ukraine, from the point of view of a more rational exploitation of cultivated areas, made an important step forward, taking a place if not among the countries where intensive culture prevails, at least among those that hold an intermediate position.

The progress of the intensification of Ukrainian agriculture, is even better enlightened on the basis of the relation between areas to artificial meadows and other fodder crops on one side, and the area to cereals on the other (18.6 per cent. in 1938 against 2.4 per cent. in 1913). In a way of comparison, it may be mentioned that the corresponding percentages in 1938 are 5.8 per cent. for Yugoslavia, 6.5 per cent. for Romania, 16.1 per cent. for Poland, 20.6 per cent. for Hungary, 31.7 per cent. for Germany within the boundaries of 1937, and 36.2 per cent. for Italy.

If the data of 1913 and 1938 set the points of departure and arrival, a long series of figures for the intermediate years prove that this process of intensification of Ukrainian agriculture, notwithstanding some more or less perceptible oscillations in some years, has developped organically, following the highroads of other countries which, for a number of reasons, it had not been in a position to follow before.

Cereal Crops.

In 1938, cereal crops occupied 69.4 per cent. of the total sown area and represented therefore, the most important part of the agricultural production of the country.

In the Table VI which shows the distribution of sown areas in Ukraine in 1913, and in 1928 —in which year the five-year plans were begun— and during the 5-year period 1934 to 1938, we have included, besides cereals all the other crops which will be dealt with later.

VI. — *Distribution of sown area in Ukraine.*

(thousand acres)

CLASSIFICATION	1913	1928	1934	1935	1936	1937	1938
TOTAL AREA SOWN	**56,572.1**	**61,602.6**	**64.314,3**	**63,534.5**	**63,218.5**	**62,085.7**	**63,262.1**
Cereals and grain leguminous plants	*51,177.0*	*48,577.5*	*49,916.5*	*47,677.8*	*46,282.6*	*44,957.6*	*43,903.0*
Winter cereals:							
Winter barley	28.4	1.5	—	—	—	1.0	9.4
Winter rye	9,129.9	8,808.2	9,256.7	9,043.7	8,803,3	8,133.1	7,705.8
Winter wheat	5,496.4	3,957.0	12,407.1	14,056.3	14,820.6	15,896.0	15,916.0
Total	*14,654.7*	*12,766.7*	*21.663.8*	*23,100.0*	*23,623.9*	*24,030.1*	*23,631.2*
Spring cereals and grain leguminous plants:							
Spring wheat	13,813.9	7,745.4	3,655.0	3,004.4	3,189.7	2,870.4	2,486.2
Spring barley	12,604.8	9,172.7	7,874.1	7,547.0	7,450.8	6,995.4	6,922.0
Oats	5,248.6	5,532.8	4,725.0	4,533.0	4,117.6	3,980.2	3,994.8
Maize	1,339.6	5,877.5	3.359.2	2,783.9	2,783.2	2,531.1	2,508.7
Millet	1,215.5	3,932.7	4,630.6	2,612.2	1,141.1	1,086.8	1,033.9
Buckwheat	1,459.7	2,464.9	1,571.4	1,702.3	1,543.2	1,479.4	1,649.5
Rice	—	—	0.2	1.0	1.5	2.2	3.7
Grain leguminous plants	785.1	577.7	1,282.2	1,375.7	1,505.9	1,323.0	1.135.5
Other cereals	55.1	507.1	1,155.0	1,018.3	925.7	659.0	537.5
Total	*36,522.3*	*35,810.8*	*28,252.7*	*24,577.8*	*22,658.7*	*20,927.5*	*20,271.8*
Industrial crops	*1,995.7*	*5,469.3*	*5,615.8*	*5,711.4*	*5,650.9*	*5,827.8*	*5,932.6*
of which							
Cotton	—	—	386.2	387.2	476.2	553.3	564.6
Flax for production of fibre (Dolgounetz)	189.0	163.6	133.4	232.3	253.0	280.2	278.2
Flaxseed (Koudriach)			103.0	108,7	101.3	133.9	150.0
Hemp	260.0	422.8	235.7	259.5	313.6	352,6	403.0
Sunflower	180.4	3,136.1	2,016.2	1,927.0	1,711.5	1,660.6	1,651.7
Castor-seed	—	24.7	49.2	62.8	98.8	124.5	123.8
Soya	—	—	19.8	55.1	52.9	142.6	151.7
Tobacco and Makhorka	47.7	59.6	115.4	122.3	126.8	123.1	121.8
Sugar-beet	1.318.6	1,599.0	2,030.5	2,095.5	2,136.8	2,018.1	1,991.0
Potatoes and green vegetables	*2,017.9*	*5,153.2*	*4,741.3*	*5,259.5*	*5,271.6*	*4,918.5*	*5,192.3*
of which							
Potatoes	1,533.1	3,338.4	2,368.8	3,158.5	3 508.0	3,305.6	3,680.9
Feed crops	*1,240.2*	*1,684.5*	*3,975.5*	*4,805.0*	*5,886.1*	*6,293.6*	*8,153.4*
Other crops	*141.3*	*718.1*	*65.2*	*80.8*	*127.3*	*88.2*	*80.8*

Wheat is the country's most important crop. The total area to wheat which in 1928 had much decreased (about 40 per cent. as compared with 1913), in the following years went on increasing until, in 1938, it neared the level of 1913 with 18,402,000 acres. The area to rye which now holds second place, has shown a tendency to decrease, especially in recent years. In 1938 rye was grown over 7,706,000 acres against 9,130,000 in 1913. Barley, a Spring crop almost entirely, from 12,605,000 acres in 1913, went down to 6,922,000 acres

in 1938. The same tendency is shown by oats, which in 1938 held fourth place with 3,995,000 acres. In order to better understand the evolution of cereal cultures, a distinction between Winter and Spring crops is necessary. A rational subdivision between areas to Winter and areas to Spring cereals, besides allowing a better utilization of machinery, animals and labour etc., is required also by weather conditions, especially in the Southern and South-Eastern zones of the country. While rye, whose culture is mainly concentrated in the Northwestern regions, is a winter crop, wheat can be raised in Ukraine both as a Winter and as a Spring crop. Spring wheat, however, is exposed to heavy risks, on account of frequent periods of drought which in some zones make results quite uncertain. Hence, the tendency to increase the area sown to Winter wheat at the expense of Spring wheat. The former increased from 29 per cent. of the total area sown to wheat in 1913, to 86 per cent. in 1938; the latter, at the same time, decreased from 71 per cent. to 14 per cent. The same decreasing phenomenon is noticeable in the case of both barley and oats.

The area to Spring wheat, barley and oats fell from 31,667,000 acres in 1913 to 13,403,000 acres in 1938: a reduction of about 58 per cent. It must be mentioned that the problem of the substitution of Winter cereals in the place of Spring straw ones is very old, and had been much discussed in Ukrainian agricultural circles. This substitution had been already advocated by experimental stations in Ukraine long before the first world war. The development of mechanization made it easier to put it into practice in late years.

It was quite natural that *maize* should take a very important place in Ukrainian cereal culture, both as first rotation crop and its value as fodder. For a number of circumstances, the area destined to maize, which in 1928 had been four times greater than that of 1913, has later (especially in the last five years), strongly decreased. In 1938, however, it was twice as large as in 1913. But undoubtedly maize has found very important rivals in other cultures, especially industrial ones.

Millet and *buckwheat* are generally crops of secondary importance which only in case of emergency show a tendency to increase considerably.

Lastly, areas to *grain leguminous plants*, which in Soviet statistics are registered together with cereals, have much increased.

All in all, Winter and Spring cereals, which in 1913 represented 25.9 and 64.6 per cent. of the total sown area, in 1938 amounted respectively to 37.4 and 32.0 per cent. of that total.

VII. — *Production of cereals in Ukraine.*

CEREALS	1913	1928	1932	1937
Cereals (total) *(thousand centals)*	451,508	306,223	323,199	501,994
of which				
Wheat *(thousand centals)*	158,513	73,635	123,459	222,227
Wheat *(thousand bushels)*	264,183	122,722	205,761	370,370

Unfortunately, data on cereal production are not as complete and detailed as those of area. We must, therefore, limit ourselves to publish only the few elements which we can find in the most recent official publications.

These figures do not allow an analysis for a series of years; but by comparing the data of 1913 and 1937,—in both years the crop was very good— it may be seen that the total cereal production of 1937 is 11 per cent. higher than that of 1913, while the respective area decreased 12.2 per cent. Yields per acre went from 8.8 centals per acre in 1913 to 11.2 centals per acre in 1937. Wheat production in 1937 was 40 per cent. larger than that of 1913, while area decreased 5 per cent.: yields per acre grew from 8.2 centals (13.7 bushels) per acre in 1913 to 12.0 centals (20.1 bushels) per acre in 1937.

It must not be forgotten that statistical methods in more recent times have been subject to modifications as compared with those of 1913, and it is, therefore, necessary to make some reservation regarding the comparability of these data. A remarkable increase in unit yields, however, was undoubtedly registered, as a consequence of the development of mechanization, of a larger use of fertilizers, of the spreading of selected seeds, and new varieties of the same, and lastly of a general improvement in cultural methods.

We complete the above data on production by giving in the following Table the average yields per acre in the five years 1909-1913, in the three years 1932-1934, in the three years 1937-1939 and lastly in 1939.

VIII. — *Yield of cereals in Ukraine.*

Crops	Average 1909-1913	Average 1932, 1933 and 1934	Average 1937, 1938 and 1939	Year 1939	Average 1909-1913	Average 1932, 1933 and 1934	Avegage 1937, 1938 and 1939	Year 1939
	centals per acre				bushels per acre			
Winter rye	8.7	7.4	10.7	10.3	15.6	13.2	19.1	18.3
Winter wheat	9.3	8.3	12.8	14.2	15.5	13.8	21.3	23.6
Spring wheat	6.2	6.5	6.8	9.2	10.4	10.9	11.3	15.3
Spring barley	8.3	8.3	11.2	13.6	17.3	17.3	23.4	28.3
Oats	9.5	7.8	10.0	11.0	29.8	24.3	31.2	34.3
Maize	9.9	8.3	13.4	14.0	17.7	14.8	23.9	25.0
Millet	8.8	5.4	8.9	10.3	17.7	10.9	17.8	20.7
Buckwheat	6.1	4.5	5.2	4.5	12.1	8.9	10.3	8.9
Cereals	*8.1*	*7.6*	*11.0*	*12.1*	—	—	—	—

Data for 1935 and, more especially for 1936 are not available. Yields in those two years were notoriously very low, and therefore the composition of available averages may be rather doubtful. But even taking this fact into account, and notwithstanding the reservation made before about the comparability of more recent data with the preceding ones, the increase of unit yields in late years as compared with the averages of the five years 1909-1913, appears fully confirmed.

A broadly approximate estimate of the probable production in the years 1937-1939, leads us to set at about 990 lb. a year the average production per head of bread-making cereals in Ukraine. Nearly 3/4 of this total are wheat: the rest

is rye. Only a limited number of extra-European countries can register a higher per head production of bread-making cereals. They are: Canada, Australia and Argentina, where production, during the 5-year period 1934-38, has reached 1,473; 1,362; 1,204 lb. a year, respectively. In a way of comparison, we mention that, in the same period 1934-1938, the average per head production of these cereals in the chief overproducing countries of Europe was only 717 lb. a year in Hungary, 635 lb. in Bulgaria, 425 lb. in Romania and 384 lb. in Yugoslavia.

Industrial Crops.

The area to industrial crops which in 1913 amounted to 1,996,000 acres has increased with a constant rythm until, in 1938, it had almost trebled it having reached 5,933,000 acres. The number of industrial cultivated crops has also increased by the introduction of new ones, such as cotton, castor-oil plant, soya and others that in 1913 were not cultivated at all or whose cultivation was absolutely limited.

Sugar beets still represent the most extensive culture in Ukraine. Yet, in spite of the fact that the area sown to this crop has considerably increased, (1,319,000 acres in 1913 against 1,991,000 acres in 1938), its relative importance in the group of industrial crops has greatly diminished. In 1913 this crop occupied 66 per cent. of the area destined to all industrial crops, while in 1938 it had fallen to 33 per cent. Sugar beets are mostly grown in some Ukrainian provinces (Kiev, Vinitza, Kamenets-Podolsk, Poltava and Kharkov), where climatic conditions are more favourable. In the Southeastern regions the lack of sufficient rainfalls limits or even prevents the raising the sugar beet crops.

Data on production are comparatively few: 196,937,000 centals (9,847,000 short tons) in 1913; 185,520,000 centals (9,276,000 short tons) in 1928; 94,279,000 centals (4,714,000 short tons) in 1932 and 318,230,000 centals (15,911,000 short tons) in 1937. Yields per acre have increased from 149.9 centals (7.5 short tons) per acre in 1913 to 157.9 centals (7.9 short tons) in 1937. In the years 1938,1939 and 1940, yields per ha. were respectively 146.3 (7.3), 129.4 (6.5), and 160,6 centals (8.0 short tons). The remarkable oscillations registered these last years were due both to more or less favourable or unfavourable weather conditions and to the spreading of some pests which, in some zones especially, did considerable damage to the crops. In some parts, it was even impossible to harvest the crop. The second place among industrial crops is held by *sunflower*.

This crop, which in 1913 was raised on only 180,000 acres, in 1928 covered an area of 3,136,000; later there was a considerable decrease, and in 1938 the area to sunflower had gone down to 1,652,000 acres. Notwithstanding this strong decrease, sunflower is still the chief oleaginous crop in Ukraine. The most important centers of its cultivation are in the Southeastern part of the country.

To the decrease of the culture of sunflower has contributed, in a considerable measure, the introduction of *cotton* cultivation, which, utterly unknown in 1913, was grown over an area of 565,000 acres in 1938 when it took third place among the industrial crops of the country. Unfortunately, available data on production are few. In 1932, over an area of 447,000 acres the production of unginned

cotton was only 64,816,000 lb. with an average yield of 143 lb. per acre; in 1937, production had grown to 253,092,000 lb. and yield to 455 lb. per acre. Cotton cultivation is concentrated in a relatively small zone (provinces of Zaporojie and Nikolaiev).

Flax occupies fourth place. Area sown to this crop has more than doubled since 1913. In 1938 the « dolgounetz » variety, which is cultivated for fiber and seed, was raised over 278,200 acres; in the same year the variety « kudriache » which is cultivated exclusively for seed, occupied about one half of the area destined to the « dolgounetz » variety: 150,000 acres.

Immediately after comes *hemp*, which from 260,000 acres in 1913, went up to 403,000 acres in 1938. It seems that this culture could be still increased.

The *Soya* and *castor-oil* crops, with a regular increasing rythm, have already consolidated their position in Ukrainian agriculture. In 1938, soya covered 151,700 acres, and the castor-oil crop 123,800 acres.

Among lesser oleaginous crops, must be mentioned winter colza, which in 1938 was grown over 172,000 acres, and groundnut and perilla grown over a very limited area.

From this brief survey it clearly appears that oleaginous crops (including also cotton, flax and hemp inasmuch as they produce seed) have considerably spread in comparison with 1913.

The culture of *tobacco* and *makhorka* has stabilized around 124,000 acres in the five years 1934-1938, nearly doubling its area in comparison with 1913.

Potatoes and green vegetables.

The group of *potatoes and green vegetables* which includes principally potatoes, was raised in 1938 on more than doubled areas in comparison wich 1913, both as regards potatoes and the other food crops.

Forage Crops.

The constant increase of forage crops, which from 1,240,000 acres in 1913 have gone up to 8,154,000 acres in 1938, is one of the most significant facts in the evolution of Ukrainian agriculture, inasmuch as, by insuring a greater and more constant quantity of feed for livestock, it puts livestock breeding on a safer basis, and also because a larger extension of artificial meadows, mostly covered with leguminous plants, makes the passing to more rational cultures possible.

Livestock breeding.

The number of livestock in Ukraine, compared with that of the whole Soviet Union, amounted in 1938, to 27.9 per cent hogs, 18.1 per cent. horses, 15.2 per cent. cattle (both as to the total of the kind and to cows alone), and lastly

only 5 per cent. sheep and goats, together. Variations in the number of livestock in Ukraine were very considerable during the years between the first and the second world war, as the following Table shows.

IX. — *Livestock in Ukraine.*

(thousand of head)

Years	Horses			Cattle				Sheep and Goats	Pigs
	Total	Horses for work	Others	Total	Cows	Oxen	Other cattle		
1. July 1916	5,477.2	4,428.2	1,049.0	7,706.6	3,139.8	676.7	3,890.1	6,379.8	4,629.4
1. July 1923	3,793.6	3,109.8	683.8	7,382.6	3,715.8	758.5	2,908.3	8,368.9	2,390.7
1. July 1924	3,996.3	3,240.4	755.9	8,307.7	3,719.9	757.9	3,829.9	9,323.9	4,281.7
1. July 1925	4,180.4	3,318.0	862.4	8,197.5	3,857.1	693.8	3,646.6	9,748.9	3,738.0
1. July 1926	4,623.7	3,592.7	1,031.0	8,359.7	3,941.4	773.7	3,644.6	8,732.6	3,657.9
1. July 1927	5,056.5	3,900.1	1,156.4	8,374.5	3,852.1	805.5	3,716.9	7,956.3	4,412.4
1. July 1928	5,486.9	4,090.5	1,396.4	8,604.8	3,987.0	895.3	3,722.5	8,112.2	6,962.9
1. July 1929	5,607.5	4,198.8	1,408.7	7,611.0	3,873.0	593.7	3,144.3	7,030.8	4,161.2
1. July 1930	5,308.2	3,721.6	1,586.6	6,274.1	3,471.6	254.8	2,547.7	4,533.4	3,171.8
1. July 1931	4,781.3	3,593.7	1,187.6	6,189.5	3,377.0	113.8	2,698.7	3,364.8	3,373.3
1. July 1932	3,658.9	...	...	5,006.7	2,739.5	105.2	2,162.0	2,109.5	2,623.7
1. July 1933	2,604.8	...	...	4,446.3	2,407.2	116.9	1,922.2	2,004.7	2,089.2
1. July 1934	2,546.9	2,197.3	349.6	5,277.5	2,518.0	156.5	2,603.0	2,197.1	4,236.7
1. January 1935	2,414.9	...	...	4,960.0	2,444.3	...	...	1,767.1	3,796.3
1. January 1938	2,937.2	...	...	7,759.4	3,458.9	...	...	3,301.5	7,729.7

Strictly speaking, data are not comparable, since from 1916 (no statistics are available for 1913) until 1934 they refer to the ist July, while for 1935 and 1938 they refer to the 1st January. No data are available for the years 1936 and 1937. In the case of some species – hogs, sheep and goats – statistical data gathered at these two different times, can give quite different results.

The number of *horses*, after a strong decrease in 1923, went up again to the level of 1916 only in the three years 1928-1930. After that period, there was another rapid decrease. The figures of 1938, although they indicate a slight improvement, represent little more than one half of the figures of 1916. One of the chief reasons of this strong diminution is the widespread use of mechanical power which followed the progressive mechanization of Ukrainian agriculture.

As regards *cattle*, changes in their numbers were not many, except during the first years of mass collectivization when a minimum was reached in 1933 with 4,446,300 head against 7,706,600 in 1916. In 1938 the number of cattle (7,759,400 head) was already slightly over that of 1916. The percentage of cows has remained almost unvaried (40 per cent. in 1916 and 44 per cent. in 1938) A strong decrease is registered, on the contrary, in the number of oxen, probably for the same reason that caused a decrease in the number of horses.

As regards *sheep*, the period 1923-1929 is characterised by a more or less important increase; but from 1930 on, a very rapid regression begins. In 1934 sheep and goats (the latter represented only a small part of the total) were

2,197,100 head against a maximum 9,748,900 in 1925. Later, the comparison between the figures at January 1, 1935 and those at the same date in 1938 shows a remarkable increase from 1,767,100 to 3,301,500 head. The strong variations in the number of sheep and goats were partly due to the specific conditions under which livestock raising in Ukraine took place (rapid collectivisation of agriculture strongly opposed, in the first years, by some categories of farmers) and partly to the intensification of agriculture, which necessarily took away from sheep a part of natural meadows and pastures. As was noted before, Ukraine is one of the poorest countries in Europe in natural meadows and pastures with only 8.5 per cent. of the territorial area, while (to mention only some of neighbouring countries) natural meadows and pastures, in 1938, amounted to 14.8 per cent. in Romania, 16.7 per cent. in Poland and 17.4 per cent. in Hungary.

As regards *hogs*, it is known that changes in their number are a sort of very sensible barometer of all economico-social modifications. In Ukraine, variations in the number of this kind of livestock have been very strong, although not as strong as in the case of sheep and goats. In 1933 the minimum level was reached during the whole period surveyed in the Table, with 2,089,200 head. By January 1, 1938 the number had gone up to 7,729,700 head against 4,629,400 in 1916. If these statistics referred all to the same date, in as much as it is known that the number of hogs at the first of January is generally considerably lower than at the first of July, the increase (about 67 per cent.) would appear even more remarkable. Evidently a greater area to maize, potatoes and sugar beets had a great influence on this increase during recent times.

The different regions of Ukraine grow livestock in a widely different measure, according to the structure of their respective agricultural production. We indicate in Table X the density of livestock expressed in adult cattle per 100 acres of area sown.

X. — *Density of Livestock (expressed in adult cattle) per 100 acres of area sown.*

Regions	Number of Livestock	Regions	Number of Livestock
	Head		Head
Jitomir	27	Dniepropetrovsk	14
Kamenets-Podolsk	25	Kharkov	14
Tchernigov	21	Stalino	13
Kiev	20	Voroshilovgrad	12
Vinnitsa	19	Kirovgrad	11
Soumy	18	Odessa	11
Moldavia	17	Zaporojie	11
Poltava	16	Nikolaiev	9

While the average for the whole of Ukraine is 38 head per 100 acres of area sown, the differences from this average in several provinces are very great. The biggest density, in many cases remarkably above averages, is registered in the

Northwestern zone where a more intensive form of agriculture prevails. On the contrary, in the Southeastern zone, where agriculture is less intensive and production is mostly cereal crops, the density is always below average: in some provinces even to a ramarkable degree.

Economico-technical conditions of agricultural and livostock production.

A few data will be sufficient to show how great has been the change that has taken place in Ukraine, during the last ten years, in the relative importance of the single categories of agricultural holdings. In 1928, when it may be said that the first period of slow collectivization was over, on a total of 5,184,399 agricultural holdings, 889 were State, 9,734 collective, and 5.173.776 individual holdings. Later, in the course of ten years, the situation has been reverted. The 27,393 collective holdings existing in 1938, already included 96.7 per cent. of agricultural holdings in Ukraine. The number of State holdings had gone down to 802. Suffice it to say that in 1938 the sown area in State and collective holdings (for the latter ones, only in the area collectively owned) represented, on the whole, 92.5 per cent. of the total sown area in the country, and we get an exact idea of the change that had taken place. The 27,393 collective holdings possessed 52,790,000 acres of sown area, i. e., an average of about 2,000 acres for each one of them. Even though their size varies from one zone to the other, the substantial fact remains that, instead of over 5,000,000 small and medium-sized individual farms which existed before, only remained a little over 27,000 large collective holdings. The average size of State holdings in 1938 amounted to 7,400 acres of area sown.

Agricultural collectivization had deeply modified the technique of agricultural production in Ukraine, making it possible to introduce a large number of agricultural machines of the most perfected types, which are used not only for cereals, but also for all the other plants (industrial, food and forage ones). They are also used for all different kinds of cultural operations, the gathering in of products, and their first elaboration, as in the case of flax, hemp and others.

At the basis of agricultural mechanization in Ukraine are the so called " Stations of agricultural machines and tractors ". It is interesting to note that the first of these stations, by the initiative of the co-operative societies of the country, was started just in Ukraine. The happy results of the activity of the first station which gave a strong impulse to the rational organization of agricultural holdings, has induced the Soviet government to make them the fundamental technical element of agricultural collectivization.

Leaving details aside, a few data are given below, which characterize the development of mechanization in Ukrainian agriculture.

It is known that in the years following 1938, mechanization made further progress. But more recent data are lacking.

If collectivization of agricultural production has found its technical basis in the wide and deep mechanization of the greatest part of its processes, not so much can be said about livestock production, because, until a few years ago, livestock raising was not done under a collective system, but was still practiced

in the holdings owned by individual kolkhosians. With the increase of forage cultures and the new government regulations, aiming at the creation in the collective holdings of particular sections for the collective breeding of livestock, this branch of agricultural activity has also begun to develop rapidly. In fact, at the first of January 1940, 81.5 per cent. of the 27,374 collective holdings owned already three special sections for livestock raising, 16.9 per cent. owned two sections and only 1.6 per cent. owned 1 section.

XI. — *Development of agricultural mechanization in Ukraine.*

Classification	1929	1933	1938
Number of tractors at the beginning of the year	8,600	51,300	83,900
Tractors H. P. at the beginning of the year	96,000	719,700	1,495,400
Number of combines at the beginning of the year	—	4,900	26,700
Number of stations of agricultural machines and tractors . .	2	657	958
Percentage of area sown in collective holdings served by the stations of agricultura machines and tractors, compared with the the total area sown in all collective holdings (in per cent.)	—	77.1	98.8

The rapid advance of mechanization in Ukrainian agriculture has been partly preceeded and partly followed by the formation of the necessary technicians.

The wide spreading of agricultural schools of various types, the network of institutions of agricultural experimentation, the organisation of professional evening schools for farmers, the advertising done by the stations of agricultural machinery and tractors among the agricultural population, have actually created a new atmosphere of work among farming people, whose technical preparation has greatly improved. A numerical demonstration of this progress can be given by the fact that, lately, in Ukraine there were one agricultural expert for every two and one zootechnician for every four agricultural collective holdings.

Naturally the great development of mechanization has a tendency to cause a decrease in the demand for labour and to create a surplus in the agricultural population. In late years, therefore, various measures had been taken to absorb this surplus. These measures aimed at encouraging a further intensification of livestock and fowl breeding, an increase of orchards, mulberry-tree plantations and silk-worm raising establishements. At the same time it was thought that a part of the surplus of agricultural population could be employed in the further increasing industries of the country.

A summary of the condition of agriculture in Ukraine as regards the organisation and exploitation of sown areas, is furnished by the following Table XII, relative to the year 1938. In this Table are indicated separately the single classes of holdings and the areas of each one of them destined to each single category of culture. The Table also gives the percentages of the distribution of these areas among the single groups of crops and the single categories of holdings.

Let us now summarize the most significant data. Compared with the sown area of the whole country, the area owned by collective holdings amounts to

83.4 per cent.; the area personally owned by members of collective holdings 5.6 per cent.; the area of State holdings 9.1 per cent.; area belonging to workmen and employees 1.6 per cent. Individual holdings cover only 0.3 per cent. of the total area.

It may thus be seen that practically, individual holdings (including in this category only the land of farmers that have been completely left out of collectivization), are of no importance whatsoever in Ukrainian agriculture.

XII. — *Distribution of areas sown in 1938 in Ukraine in the different categories of Agricultural holdings.*

Classification	Cereals and grain legumi-nous crops	Industrial crops	Potatas and green vegetables	Fodder crops	Other crops	Total
A) *Area in thousand acres.*						
State holdings	3,416.3	238.0	249.8	1,851.1	0.7	*5,755.9*
Collective holdings (area collectively owned).	39,416.1	5,549.6	1,952.7	5,791.7	79.8	*52.789.9*
Area owned by members of collective holdings	742.3	110.7	2,244.7	448.3	—	*3,546.0*
Area owned by workmen and employees	248.3	30.9	670.9	55.4	—	*1.005.5*
Individual holdings	79.8	3.5	74.1	6.9	0.2	*164.5*
Total	**43,902.8**	**5,932.7**	**5,192.2**	**8,153.4**	**80.7**	**63,261.8**
B) *Proportional distribution in per cent. between the different groups of crops, of the total area sown in each category of holdings.*						
State holdings	59.4	4.1	4.3	32.2	0.0	*100.0*
Collective holdings (area collectively owned).	74.7	10.5	3.7	11.0	0.1	*100.0*
Area owned by members of collective holdings	20.8	3.1	63.4	12.7	—	*100.0*
Area owned by workmen and employees	24.7	3.1	66.7	5.5	—	*100.0*
Individual holdings	48.5	2.1	45.0	4.2	0.2	*100.0*
Total	**69.4**	**9.4**	**8.2**	**12.9**	**0.1**	**100.0**
C) *Proportional distribution in per cent. between the different categories of agricultural holdings of the area destined to each group of crops.*						
State holdings	7.8	4.0	4.8	22.7	0.9	*9.1*
Collective holdings (area collectively owned).	89.7	93.5	37.6	71.0	98.8	*83.4*
Area owned by members of collective holdings	1.7	1.9	43.3	5.5	—	*5.6*
Area owned by workmen and employees	0.6	0.5	12.9	0.7	—	*1.6*
Individual holdings	0.2	0.1	1.4	0.1	0.3	*0.3*
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The distribution of the sown area among the different categories of holdings is also characteristic. In State holdings, the percentage to cereals is 59.4 per cent.; that to fodder crops is 32.2 per cent. There is a growing tendency to sow fodder areas to cereal production, but animal production has also acquired a remar-

kable importance on them. In collective holdings (on land collectively owned) the area to cereals is larger (74.7 per cent.) than in State holdings, while the percentage of forage crops is considerably lower (11.0 per cent.), and that of industrial crops considerably higher. In the other categories of holdings, the high percentage of areas destined to potatoes and vegetables indicates that there is a big prevalence of food crops for home needs.

We may conclude by stating that, after a period which was not long in years but full of deep politico-social convulsions, between the end of the first world war and the beginning of the German-Soviet conflit, Ukrainian agriculture underwent a big transformation. Individual holdings have lost all importance in the mass of the country's agricultural production; instead of over 5 million small and medium-sized individual agricultural holdings, have been formed only little more than 27,000 collective holdings which have the characteristics of large undertakings not only on account of their zize, but also because they are all under one and the same technical direction and possess the necessary machinery to carry on a rational agriculture. The organization of the agricultural territory of the country has also undergone a profound modification as a result of its subdivision among the great categories of crops. The same process of transformation which in many countries took place decennials ago and through a very long period of time, in Ukraine has taken place only recently and within a far shorter period. While answering above all the needs and the interests of the country itself, the new organization of the agricultural territory in Ukraine is not so much detached from the highway through which developed agriculture in other great countries.

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE, BARLEY AND OATS.

Bulgaria: Bad weather during the month of May and above all great floods have endangered the cereal crops.

Croatia: Owing to heavy floods in the Spring, the cereal crop appears to be less abundant than had been estimated. According to unofficial information, wheat production in 1941 amounted to 14.551.000 centals (25.983.000 bushels) against an average of 16.314.000 centals (29.133.000 bushels) in the years 1937-1939. This last estimate was officially published by the Croatian ministry of Commerce, and was made on the basis of data drawn from Agricultural Yearbooks of 1937, 1938 and 1939 of former Yugoslavia.

Denmark: According to press information, the condition of cereals, following the period of May rainfall, had considerably improved. If in some zones rye had suffered from winter cold, it can now be said that it has generally recovered exceptionally well.

Spain: According to press information, weather conditions were particularly favourable to cereal crops. Rain fell just at the time crops needed it and the weather was warm and dry at the proper moment. In most regions, all cereals developed vigorously in spite of the lack of fertilizers. It is estimated that in some regions, especial

as regards wheat and rye, yields will near the top ones of 1932 and 1934. Although the area sown to wheat is still from 1.700.000 to 2.000.000 acres below that of pre-civil war times, it is forecast that harvests may yield from 79 million centals (132 million bushels) to 88 million centals (147 million bushels). The other cereals, especially rye, have also grown very well.

At the end of May, forecasts on cereal crops were generally favourable. Information abount the crops in Andalusia, Manche, Estremadura, Castille le Vieille, Levante and Murcia is good. In Arragon, too much rain has done some damage. In some zones, the scarcity of fertilizers has contributed to lower yields.

Finland: Temperature and rainfall in the month of May were a little below average. Winter crops hibernated well and their condition at the first of June was considered generally good. Spring sowings were done under favourable conditions and vegetation is better than last year.

France: According to press information, the Government has established in a certain number of Departments some indemnities for farmers that have re-seeded their fields. The indemnity is 700 francs per hectare (2,5 acres) re-seeded to summer wheat and 560 francs per hectare (2,5 acres) re-seeded to barley.

Hungary: During the two weeks ending May 19, the weather was favourable to crops. The cold winter, however, and the unfavourable weather at the beginning of Spring hindered vegetation so badly and so retarded sowings that, in order to see a substantial improvement in the condition of crops, a further long period of fine weather is needed. The sprouting of winter wheat is generally unsatisfactory, and crops are thin and low. Here and there, cereal crops had began to turn yellow on account of excessive wetness. Rye and winter barley are also thin and low. Spring cereals appear in good condition and their growth is satisfactory.

During the two weeks ending June 6, the weather was favourable both to the growth of crops and plowing. Winter cereals have improved, but in some spots hey are low and thin. Spring cereals on the contrary continued to grow vigorously, but in some places they are hindered by weeds.

Romania: During the second part of May, the weather was milder and the sowings of Spring cereals could be continued. According to an approximate estimation, by May 16 nearly 70 per cent. of the area foreseen by the agricultural plan for all Spring cereal cultures, including maize, meslin, bean and forage plants, had been seeded. By May 24 the percentage of area actually seeded wes 88 per cent. of the plan. Sowing works continued also during the first half of the month of June, so that towards the middle of this month the Ministry of Agriculture could announce that the whole arable area of the country, except land still under water, has been seeded. It announced also that fallow land is the same as last year. Spring sowings this year were done under particularly difficult conditions, on account of weather being unfavourable and war raging, with consequent lack of labour hands and draft animals. As regards the condition of cereal crops, it may be said only that rains at the beginning of June were especially helpful to all cereals including spring cereals which showed that their growth was greatly retarded. It is foreseen that area to oats and Spring barley will be increased. For this latter crop, the Ministry of Agriculture has established a competition similar to that for maize, in order to encourage among farmers a more advanced agricultural technique. For the same purpose and in order to increase unit yields, which in Romania are too low for all crops, an inter-communal tillage competition to take place in the 1942-43 season, has been instituted. The competition will take place right after the storing of crops.

Serbia: Heavy floods during the month of May have seriously damaged cereal crops. Contrary to previous optimistic forecasts, yield are expected to be lower than was anticipated.

Sweden: The temperature was rather low during the months of April and May, and till about May 15, the weather was quite dry. After that date it rained sufficiently. The cold of the winter and drought after the melting of the snow, did some damage to the crops, especially to wheat. The condition of the wheat crop at June 1, according to the system of the country, was 2.3, against 1.7 at the corresponding date the year before. Figures relative to winter rye are, 3.1 and 2.7.

Surveys made by agricultural authorities last April on damages suffered by crops during the extreme cold of the winter have shown that rye went through the winter very well and only along the western litoral yields will be below average. Wheat, on the contrary, appears to have been affected by the cold of the winter in most regions. In some districts of western Sweden, crops had to be re-seeded, especially barley, mustard and sugar beets. In a general way, however, it can be said that at the end of April forecasts were better than last year, when (as will be remembered) harvest was very bad. Estimates have further improved after the heavy rainfalls of the and of May. The condition of the rye crop is absolutely good and re-seeded wheat is growing in fine shape.

Switzerland: Weather conditions during the month of May were quite ideal. After a period of heavy frost and drought, the weather turned to very good; rains alternated with sunshine and warmth, and vegetation was greatly stimulated therefrom.

Autumn cereals partly recovered pretty well from damages caused by the long winter cold. Rain fallen after Spring frosts was favourable to crops. Many fields appear in fine shape, especially those sown to wheat and spelt. Some crops are found, however, that have heavily suffered. In western Switzerland, one fourth or one third of Autumn wheat had to be sown over again here and there. Nearly everywhere rye is late and thin; in many fields spring wheat has been sown.

Autumn barley crops, which in many places had been considered lost, have recovered quite well and appear now in a fine shape. Unfortunately fields may still be seen which were hit by rust. No other remedy can be found against this malady, except a change of seedings in the next few years and the proper treatment of the seme. Spring cereals appear everywhere in fine condition and a good harvest is forecasts. Many fields (especially oats fields) are too thick, and it has been necessary to thin them.

The following table is showing the condition of the various crops, exressed in the form of index-numbers (basis a very good crop made equal to 100):

	June 1, 1942	May 1, 1942	June 1, 1941
Autumn Wheat	77	70	76
Spring Wheat	76	74	73
Autumn Rye	68	62	78
Spring Rye	72	74	69
Autumn Barley	73	67	76
Spring Barley	77	76	74
Oats	79	76	79
Meslin	76	73	79
Spelt	79	76	81

Area and Production of Cereals.

Countries	Area					Production							
	1941	1940	Aver. 1935 to 1939	% 1941		1941	1940	Aver. 1935 to 1939	1941	1940	Aver. 1935 to 1939	% 1941	
	000 acres			1940 = 100	Aver. = 100	000 centals			000 bushels			1940 = 100	Aver. = 100
Wheat													
Belgium	439	(w) 354	394	—	111.4	...	...	9,691	...	...	16,151	...	...
Denmark	203	199	316	101.8	64.1	4,189	4.094	8,617	6,981	6,823	14,361	102.3	48.6
Spain	9,445	8,735	(1)8,639	108.1	109.3	65,377	47.648	63,270	108,959	79,412	(1)105.448	137.2	103.3
Finland	331	349	264	94.8	125.3	3,426	3,939	4.208	5,710	6,565	7,013	87.0	81.4
France	...	...	12,503	...	...	165,347	94,799	171,097	275,573	157.995	285,157	174,4	96.6
Ireland	491	305	225	160.9	218.4	...	7,011	4,613	..	11,685	7,689	...	...
Italy	. .	12,566	12,639	...	...	157,683	156,623	167,713	262,799	261,033	279,517	100.7	94.0
Netherlands	339	331	338	102,2	100,2	...	...	9,113	...	...	15,188	...	...
Romania	(2)5,676	(2)5,135	9,054	110,5	—	(2)43,048	(2)30,331	84,491	(2)71,745	(2)50,551	140,816	141,9	—
Slovakia	550	533	(3) 539	103.1	102.1	6,955	6,740	(3) 8,572	11,591	11,233	(3)14.287	103.2	81.1
Sweden	708	763	741	92.8	95.6	7,255	9,276	15,811	12,091	15,459	26,351	78.2	45.9
Switzerland	215	191	184	112.5	116.9	...	3,631	3,711	...	6,051	6,185	...	...
Canada	22,372	28,726	25,596	77.9	87.4	181,576	330,834	187,440	302,626	551,390	312,399	54.9	96.9
Un. St. (w)	40,316	36,147	41,186	111.5	97.9	567,540	353,491	351,467	945,900	589.151	585,778	115.8	124.1
Un. St. (s)	16,467	17,356	16.387	94.9	100.5		136,528	105,964		227,547	176,606		
Mexico	1,347	1,450	1,251	92.9	107.6	8,257	8,002	7,391	13.828	13,337	12,318	103.7	112.3
India (4)	34,499	34,003	34,485	—	—	224.400	241,562	222,396	374,000	402 603	370,660	92.9	100.9
Japan	1,983	2,024	1,738	96.1	114.1	32,377	39,682	30,078	53,960	66,135	50,130	81.6	107.6
Syria and Leb.	1,600	...	1,363	...	117.4	16,560	14,760	11,692	27,600	24,600	19,486	112.2	141.6
Algeria	...	...	4,176	...	...	19,200	16.560	20,890	32,000	27,600	34,816	115.9	91.9
Egypt	1,561	1,563	1,464	99.9	106.7	24.918	29,997	27,510	41.529	49,994	45,848	83.1	90.6
Tunisia	1,322	1,359	1,884	97.3	70.2	8,819	6,393	9,019	14.697	10,655	15,031	137.9	97.8
Argentina	(5)18,039	(5)17,569	(5)18,664	102.7	96.7	134,482	162,706	131,710	224,133	271,171	219,512	82,7	102.1
Chile	1,660	1,930	1,963	86.0	84.6	...	...	18,937	...	...	31,562	...	...
Uruguay	1,043	924	1,228	112.8	84.9	...	4,235	7,954	...	7,058	13,256	...	...
Australia	12,654	12,454	13,128	101.6	96.4	96,505	49,592	101,821	160,842	82,654	169,702	194.6	94.8
New Zealand	300	240	221	125.0	135.5	6,000	5,040	4,277	10,000	8,400	7,129	119.0	140.3
Rye													
Belgium	310	280	369	110.7	84.1	...	...	7,790	...	...	13,910	. . .	...
Denmark	474	339	352	139.6	134.7	6,614	5,908	5,552	11,811	10,551	9,915	111.9	119.1
Spain	1.473	1,361	(1)1,302	108.2	113.1	8,754	7,740	(1) 9,041	15,632	13,821	(1)16,144	113.1	96.8
Finland	467	459	578	101.8	80.8	5,137	4,627	7,774	9.173	8,263	13,883	111.0	66.1
Netherlands	596	563	559	105.7	106,6	...	...	11,386	...	...	20,332	...	...
Romania	(2) 217	(2) 227	1,076	95.7	—	(2) 1,649	(2) 1,168	9,597	(2) 2,945	(2) 2,087	17,137	141.1	—
Slovakia	372	368	(3) 380	101.1	97.8	4.409	4,403	(3) 5,259	7,874	7,862	(3) 9,391	100.2	83.8
Sweden	509	422	495	120.5	102.7	6,113	5,862	8,304	10.916	10,468	14,828	104.3	73.6
Switzerland	35	25	38	136.2	90.6	...	498	711	...	890	1,269	...	...
Canada	1,077	1,035	816	104,1	131.9	7.374	7 837	5,147	13,167	13,994	9.191	94.1	143.3
United States	3,436	3.192	3,723	107.6	92.3	26,019	22,737	25,576	46,462	40,601	45,672	114.4	101.7
Argentina	(5)2,661	(5)2,751	(5)2,511	96.8	106.0	3,086	4,678	5,586	5,512	8,354	9,974	66.0	55.3
Chile	19	24	30	81.7	64.4	...	...	173	...	...	309	...	...
Barley													
Belgium	74	57	76	130.4	98.0	...	...	1,757	...	...	3,661	...	...
Denmark	930	956	939	97.2	99.0	20,503	25,104	25,191	42,715	52,301	52,483	81.7	81.4
Spain	3,886	3,859	(1)3,382	100.7	114.9	37,146	30,769	31,262	77,390	64,103	65.130	120,7	118.8
Finland	326	281	305	116.0	106.9	2,910	3,061	4,070	6,063	6,377	8,478	95.1	71.5
Ireland	169	132	118	128.0	143.2	...	3,114	2,598	...	6,487	5,413	...	...
Romania	(2)1,347	(2)1,453	3,533	92.7	—	(2) 9,608	(2)10,944	22,494	(2)20,017	(2)22,800	46,863	87.8	—
Slovakia	489	497	(3) 492	98.5	99.5	5,842	6,719	(3) 6,946	12,172	13,999	(3)14,470	86,9	84.1
Sweden	244	264	252	92,6	97,0	3,514	4,173	4,777	7,322	8,694	9,952	84.2	73.6
Switzerland	44	28	12	159.0	351.0	...	511	206	...	1,066	430	...	...
Canada	5.449	4,341	4,291	125.5	127.0	56,457	50,043	42,663	117,619	104,256	88,882	112.8	132 3
United States	13,977	13,394	10,774	104.4	129.7	168,731	148,433	113,409	351,522	309,235	236,270	113.7	148.8
Japan	...	1,848	1.892	...	...	36,385	37,198	35,112	75,803	77,498	73,152	97.8	103.6

Area and Production of Cereals.

Countries	Area					Production							
	1941	1941	Aver. 1935 to 1939	% 1941		1941	1940	Aver. 1935 to 1939	1941	1940	Aver. 1935 to 1939	= 1941	
				1940 = 100	Aver. = 100							1940 = 100	Aver. = 100
	000 acres					000 acres			000 bushels				
Algeria . . .	...	...	3,058	...	...	15,360	7,920	15,415	32,000	16,500	32,114	193.9	99.6
Egypt . . .	255	268	278	95.1	95.1	4.699	5,315	7,339	9,789	11,073	15,290	88.4	64.0
Tunisia . . .	...	...	1,174	...	...	4,400	2,000	4,564	9,186	4,134	9,508	222.2	96,6
Argentina . .	(5)1,972	(5)2,139	(5)1,903	92.2	103.6	8,157	17,395	11,329	16 994	36.239	23,602	46.9	72.0
Chile	128	128	184	99.9	69.5	...	...	2,419	...	...	5,041	...	...
Uruguay . .	67	54	(6) 36	122.7	—	...	216	(6) 259	...	450	(6) 539	...	...
New Zealand	30	26	24	115.4	125.5	550	481	461	1,146	1,002	961	114.4	119.2
Oats													
Belgium . .	413	...	548	...	75.4	...	...	14,074	...	...	43,982	...	...
Denmark . .	846	843	926	100.3	91.4	16,314	19,641	22,303	50,982	61,378	69,697	83.1	73.1
Spain . . .	1,646	1,597	(1)1,423	103.1	115.7	12,469	10,459	(1)10,549	38,964	32,685	(1)32 966	119.2	118.2
Finland . . .	1,055	1,054	1,142	100.1	92.4	10,626	11,128	15,974	33,207	34,776	49,917	95.5	66.5
Ireland . . .	779	681	571	114.4	136.5	...	16,222	12,565	...	50,694	39.265	...	...
Romania . .	(2)1,134	(2)1,070	1,792	106.0	—	(2) 9,121	(2) 8,173	12,803	(2) 28,502	(2)25,539	40,009	111.6	—
Slovakia . .	370	365	(3) 333	101.5	131.3	...	4,596	(3) 3,660	...	14,363	(3) 11,437	...	...
Sweden . . .	1,553	1,569	1,641	99.0	94.7	17,139	20,660	27,904	53,459	64,563	87.199	83.0	61.4
Switzerland .	80	53	28	150.2	286.3	...	1.140	510	...	3,562	1,593	...	...
Canada . . .	13,841	12,298	13,246	112.6	104.5	120,138	129.379	114,94	375,430	404,309	359,201	92.9	104.5
United States	37,236	34,847	35,417	106.9	105.1	364,430	395,401	329,369	1,138,843	1,235,628	1,029,279	92.2	110.6
Algeria . . .	...	...	470	...	...	2,560	...	3,387	8,000	...	10 585	...	75.6
Argentina . .	(5)3,519	(5)3,899	(5)3,567	90.2	98.6	9,921	11,894	16,254	31,002	37,168	50,795	83.4	61.0
Chile	168	198	279	85.3	60.3	...	...	2,455	...	...	7,670	...	...
Uruguay . .	237	225	213	105,5	111.2	...	421	992	...	1,316	3,100	...	...
New Zealand	60	61	63	98.4	95.4	1.080	1,120	1,174	3,375	3,500	3,669	96.4	92.0

(*w*) Winter crop. — (*s*) Spring crop. — (1) Year 1939. — (2) Not including territories transferred in 1940. — (3) Average of two years — (4) Final estimate except for 1941 area, the figure of which is that of the fourth estimate. — (5) Area sown. — (6) Not including barley for brewery.

Ukraine: According to press information, the Spring season was quite late. After a brief warm period in the southern part of Ukraine at the beginning of March, cold weather accompanied sometimes by frost, has continued for long weeks in zones which were no longer covered by snow, and caused damages to winter seedings. Spring crops could be sown only by March 25 in the southern part of Crimea, by the 5th April in the northern part of the same territory and by the 20th and 30th April in Ukraine. In some parts of northern Ukraine the soil was so wet as to make it impossible to seed it before the month of May. According to the same source, it appears that the Spring sowing programme may be almost fully put into execution in the western an northern zones of the occupied territory of Ukraine; forecasts are not so goodregarding the southern zone, Crimea and the zones near the front.

General Government: Sowings of Spring cereals were over by the middle of June, notwithstanding the fact that they had been retarded almost a month on account of bad weather and several other difficulties. Winter cereals went through the winter months in good conditions.

Argentina: In May, unfavourable weather hindered cereal sowings.

United States: According to June estimates of the U. S. Department of Agriculture, the production of Winter wheat amounts this year to 388,159,000 centals (bushels 646,931,000) against 452,776,000 centals (671,293,000 bushels) in 1941 and an average of 366,327,000 centals (619,545,000 bushels) in the period 1936-1940. Percentages: 96.4 and 106.0 per cent. The decrease of production in 1942, compared with the year 1941, is due to a reduction of area, because unit yields this year are higher than last year. It is estimated that the production of Spring wheat, whose crop condition at June 1 was rated 89 per cent. against 87 per cent. at the same date in 1941, will amount to 130,080,000 centals (220,000,000 bushels). The total wheat production would thus amount to 520,293,000 centals (867,137,000 bushels) against 567,540,000 centals (bushels 945,900,000) in 1941 and an average of 480,273,000 centals (800,455,000 bushels) in the period 1936-1940. Percentages: 91.7 and 108.3 per cent. Rye production is estimated at 30,462,000 centals (54,397,000 bushels), against 25,307,000 centals (45,191,000 bushels) in 1941 and an average of 23,561,000 centals (42,073,000 bushels) in the five years 1936-1940. Percentages: 120.4 and 129.3 per cent. The production of barley is estimated at 192,885,000 centals (401,843,000 bushels), against 172,180,000 (358,709,000 bushels) in 1941 and an average of 115,662,000 centals (240,962,000 bushels) in the five years 1936-1940. Percentages: 112.0 and 166.8 per cent. The production of oats is estimated at 400,762,000 centals (1,252,380,000 bushels) against 376,354,000 centals (1,176,107,000 bushels) in 1941 and an average of 331,976,000 centals (1,037,424,000 bushels). Percentages: 106.5 and 120.7 per cent.

Chile: In order to intensify the cultivation of wheat, the Chilean Government has taken the following measures: Fixed price of 135 pesos per metric quintal (2,2 centals) reduction on freight over the railroads, a 2-year loan without interest to pay for the purchase of wheat seeds and delivery of fertilizers at the lowest price.

Turkey: According to the first information that has reached the Turkish Ministry of Agriculture, the yield of cereal crops this year will be considerably above average. In many regions, forecasts are so good that it is expected the increase in yield this year, as compared with 1941, will be 100 per cent. Later information from Istanbul indicates that the Turkish Government has recently issued a decree ordering the requisition of the 1942 cereal crops. The measure includes all cereal stocks. Producers will be allowed a certain quantity per person. A certain quantity of seeds will be kept for coming seedings. The amounts destined to livestock feeding will be fixed case by case by the Ministry of Commerce. Payments will be made at the moment of delivery of the crop, the date of which will be communicated in due time.

Egypt: Wheat production in 1942 is estimated at about 28,109,000 centals (bushels 46,847,000) compared with 24,918,000 (41,529,000) in 1941 and an average of 28,322,000 (47,203,000) during the 5-year period 1936-1940; percentages: 112.8 and 99.2. We must emphasize that the 5 years 1936 to 1940 were all years of very large production, particularly 1940 when the yield amounted to about 30,000,000 of centals or 50,000,000 of bushels.

CURRENT INFORMATION ON MAIZE.

Greece: According to information from the Ministry of Agriculture, the production of maize in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 3,544,300 centals (6,329,100 bushels), against 5,765,900 centals (10,296,300

bushels) in 1939 (Greece within the ancient frontiers). Maize production in 1941, distributed according to the different regions of the country, was as follows:

	Production	
	centals	bushels
Central Greece	520,100	928,700
Peloponnesus	751,500	1,341,900
Cyclades	300	600
Ionian Islands	43,700	77,900
Thessalonica	333,000	594,600
Macedonia	1,250,700	2,233,400
Epirus	640,600	1,143,900
Crete	1,400	2,500
Aegean Islands	3,100	5,600
TOTAL	3,544,300	6,329,100

Hungary: Maize sowings were done late all over the country and were still going on at the end of the second decade in May. Germination of early sowings has been defective.

Maize sawing was about over all over most of the country by June 6. Germination was poor on account of the bad quality of seeds. At that date, weeding of early varieties had begun. Good weather favoured this crop. Rain was needed in many places.

Romania: Owing to rainy and cold weather in April, the sowing of maize this year was done with considerable delay. Sowings were still going on during the last decade in May, especially in Moldavia. In many places, germination was faulty. Consequently it has been often necessary to sow important areas over again. Early varieties of maize were used for re-sowing. The seeds were put at the disposal of farmers by the Chambers of Agriculture. During the first week in June, early maize sowings were developping normally. Rain fallen at the beginning of June was particularly favourable to the crop. Beneficial, although not general, rains fell also toward the middle of June. These rains considerably improved the condition of maize fields. This year the invasion of weeds was very strong. The Ministry of Agriculture has made frequent weeding of maize fields (at least three weedings) obligatory.

CURRENT INFORMATION ON RICE.

Greece: According to information from the Ministry of Agriculture, rice production (raw) in 1941 all over Greece (not including Thrace and Eastern Macedonia, where as a matter of fact, rice is not grown) had amounted to 50,300 centals (111,900 bushels) against 99,300 (220,600) in 1939 (Greece within the ancient frontiers). The production

of raw rice in 1941, distributed according to the different regions of the country, was the following:

	Production centals	Production bushels
Central Greece	24,000	53,300
Peloponnesus	15,600	34,800
Epirus	10,700	23,800
TOTAL	50,300	111,900

Romania: The area to rice is increasing every year in Romania. A further increase is foreseen this year. Necessary irrigation works were done in the Fall 1941. Towards the middle of June, the rice crop was growing normally.

CURRENT INFORMATION ON POTATOES.

Greece: According to information from the Ministry of Agriculture, the production of potatoes in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 3,146,700 centals (5,244,400 bushels) against 3,599,400 (5,999,400) in 1939 (Greece within the old frontiers). The production of potatoes in 1941, distributed according to the different regions of the country, was as follows:

	Production centals	Production bushels
Central Greece	422,700	704,500
Peloponnesus	1,084,100	1,806,700
Cyclades	117,100	195,200
Ionian Islands	217,300	362,200
Thessalonica	243,900	406,500
Macedonia	639,400	1,065,700
Epirus	110,100	183,400
Crete	237,300	395,500
Aegean Islands	74,800	124,600
TOTAL	3,146,700	5,244,400

Hungary: By May 20, the plantation of early potatoes was over. Warm weather during the week ending May 20 was very favourable to the crop. At that time, in many places, early varieties were being weeded.

Potatoes sprouted well and good progress was registered about June 6. The first weeding had begun. Rain was needed.

Romania: Thanks to an intense propaganda by agricultural and competent administrative bodies, the area sown to potatoes this year is considerably greater than that of the year before. According to an unofficial estimate the increase as compared with the year 1941, would amount to 50 per cent. Towards the middle of June, potatoes were growing normally.

Switzerland: As far as may be seen at present, the potato crop may be rated good and very good. Planting took place under advantageous conditions. The plants however, have not so developped yet as to allow of a judgement on the appearance of maladies. Owing to the fact that many farmers would not wait until seeds were distributed by seeding stations, it is probable that tubers affected by degeneracy were sown. Areas to potatoes have been heavily increased. Some apprehension is caused by a wide spread of the doryphore, and it is feared that the malady may spread even more during the summer. The condition of the potato crop at the beginning of June was rated 80 according to the system of the country, against 73 at June 1, 1941.

Argentina: According to the first official estimate, potato production in 1941-42 was exceptionally abundant: it amounted to 30,865,000 centals (51,440,000 bushels). This production is 32 per cent. higher than the already good one of 1940-41 (23,281,000 centals – 38,801,000 bushels), and 94 per cent. above the average of the preceding five years (15,909,000 centals – 26,514,900 bushels). The excellent results obtained this year are to be attributed to the increase of cultivated area and to the employment of selected varieties of seeds.

BEET AREAS AND CROPS

The weather which up to the middle of May had been cold and dry, became more favourable to beet crops in the second part of the same month when the temperature was milder and rainfall very beneficial. The delay in the sowings has not had bad consequences, and the development of the young plants has been satisfactory, quite regular and uniform. Plowing was done almost normally, because the dearth of labour was not too accentuated, not least, as accentuated as last year. The distribution of fertilizers, on the contrary, was not such as to satisfy the demand of farmers, especially as regards phosphates; but it is believed that this fact has not caused serious damage to crops. On the whole, it may be said that at the middle of June the condition of the beet crop on Europe was decidedly better than a month before.

As regards areas sown to sugar beet, the following table shows the first known estimates. Besides estimates communicated directly to the Institute the table gives those of F. O. Licht and of the International Association of Sugar Statistics. Altogether, the table covers a number of countries amounting to almost one third of the area to beets in Europe, not including the U. S. S. R. In these countries, the increases of area to beets this year, as compared with

the year before, fully compensate decreases; and, as there are good reasons to believe that even in the countries that do not figure in the table all possible efforts are made not to diminish areas to beet crops, it may be stated that, in all probability, beet areas in Europe this year will not be inferior to those of 1941.

Acreage of Sugar-beet.

COUNTRIES	1942 (*)		1941		Average 1936 to 1940	% 1942	
		acres				1941 = 100	Average = 100
Belgium	(1)	126,752		119,727	121,686	106	104
Bulgaria	(2)	74,000	(2)	52,260	27,103	142	274
Croatia	(2)	12,800	(2)	21,333	(3) 15,365	60	84
Denmark		114,000		119,000	99,000	96	115
Spain		136,000		161,000	183,355	85	74
Finland	(1)	6,400		8,280	10,300	78	62
France	(1)	507,000	(1)	482,000	523,970	105	97
Hungary	(2)	200,000	(2)	200,000	122,519	100	161
Italy		383,000		383,000	318,622	100	120
Latvia	(1)	50,000	(1)	30,881	32,979	160	150
Lithuania	(1)	35,290	(1)	36,041	22,220	98	159
Serbia	(1)	22,000	(1)	35,410	82,594	63	—
Slovakia		40,000		47,000	(4) 39,199	84	101
Sweden		131,000		131,000	129,693	100	101
Switzerland		8,900		8,400	6,934	106	128
Turkey	(1)	77,000	(1)	101,000	74,271	76	103

(*) Approximate data. — (1) Estimate of the International Association for Sugar Statistics. — 3) Year 1940. — (4) Average of two years.

CURRENT INFORMATION ON SUGAR.

Denmark: According to press information, agricultural conditions in the different agricultural regions have considerably improved after May rainfalls. In some zones damages are lamented that plant lice have caused to young plants during the first weeks of drought in the Spring.

In some regions plant lice have appeared which have attacked young sugar beets during the Spring drought.

Hungary: At May 20, the condition of the sugar beet crop was good. In order to obtain a good yield, it would be necessary that crops were favoured by lasting fine weather.

About June 6, sugar beets were developping well.

Romania: In order to intensify the culture of sugar beets, the Romanian Council of Ministers has created a premium to be granted producers who, in the present season, will obtain a high yield. This premium is fixed at 5000 Lei per wagon of 10 tons and will be given farmers who will harvest 15 tons of beets per hectare, and 7000 Lei if the unit yield is 150-200 quintals per hectare. Seeing that the price of beets to producers is fixed at 27,000 Lei per wagon, the farmers will get, with the premium, 32,000 and 34,000 Lei per wagon, respectively.

Slovakia: By the Delegate of the Slovakian Republic we have received the following information on areas to sugar beets in Slovakia during latest years.

	Area sown acres	Area harvested acres
1942	59,800 1)	...
1941	72,398	71,111
1940	69,727	68,353
1939	52,056	51,878
1938	51,579	51,312

(1) Approximate estimate.

Areas to sugar beets considered here, include those sown to sugar beets destined to sugar refineries, those destined to distilleries, and those of the sugar beets left to the farmers for their own needs.

For beet areas destined exclusively to factories, see the general Table.

Sweden: According to press information, abundant rains at the end of May have considerably improved harvest forecasts. The conditions of the sugar beet crop is better, and if in the next weeks the weather is favourable, it may be forecast that yields will be about average in the southern regions.

CURRENT INFORMATION ON VINES.

Bulgaria: According to unofficial but recent information, wine production within the ancient frontiers of the country in 1941 amounted to only 29,260,000 Imperial gallons (35,135,000 American gallons), while the first unofficial estimate in October 1941 figured that it might have amounted to 43,995,000 Imperial gallons (52,834,000 American gallons). Wine exports of the 1941 production up to April 1942, amounted to 660.000 Imperial gallons (793.000 American gallons). The suspension of wine exports lately has caused the formation of considerable wine surplus stocks in the country, thus contributing to a fall of prices and to an increased transformation of wine into alcohol.

Spain: The condition of vines at the end of May was good. Here and there, attacks of mildew and hail have caused damages which however do not appear too serious.

France: By the middle of June, forecasts were rather good. Flowering took place under more or less satisfactory conditions. It is feared, however, that in some departements, yields this year will not be as high as in 1941.

Hungary: Warm weather in the third week of May, helped a vigorous development of Vines.

During the two weeks ending June 6, vines developped vigorously. Mildew had appeared in spots, in nearly all wine districts.

Romania: Towards the middle of June, the condition of vinyards was estimated generally good.

Switzerland: Nothing sure can as yet be said about estimates on the wine crop. In a general way, vines hibernated well. May frosts did not cause serious damages. The vegetation appears good. All will depend on flowering and on the conditions under which it will take place.

At the middle of June, the condition of vinyards was satisfactory, and rainfalls at that time favoured vegetation. With few exceptions, forecasts are good.

CURRENT INFORMATION ON OLIVES.

Spain: Olive flowering was very good, and the condition of the culture is entirely satisfactory.

CURRENT INFORMATION ON FLAX.

Hungary: Towards May 20, the development of flax was satisfactory.

About June 6, the flax crop was developping in a satisfactory manner. Weeds here and there hindered the crop.

Romania: Among textile crops, flax is the only one that was sown over a smaller area than had been planned. Spring weather conditions were unfavourable to sowings of this delicate crop.

Sweden: According to press information, the area to flax this year is 3.200 acres.

CURRENT INFORMATION ON COTTON.

Romania: The area sown to cotton this year is larger than that of last year. Towards the middle of June, the crop appeared in fine condition.

CURRENT INFORMATION ON HEMP.

Hungary: Towards May 20, hemp was growing regularly.

About June 6, the hemp crop was tufty enough and was developing satisfactorily.

Romania: In agreement with the agricultural plan, the area to hemp this year was more than double compared with 1941. At the middle of June, the crop appeared in fine shape.

CURRENT INFORMATION ON TOBACCO.

Denmark: The Central of raw tobacco recently created by the Ministry of Commerce and charged with the distribution of tobacco, has begun its work. There is at present a very heavy demand for tobacco plants. The area to tobacco is going to be increased and it is planned to cultivate only high grade varieties.

France: According to press information, the area to tobacco in 1942 is about 10,000 acres larger than in 1941. It is therefore expected that the yield will also be larger.

Greece: According to unofficial but very recent information, area and production of tobacco in Greece during latest years were as follows:

	Area (acres)	Production (pounds)
1937	236,400	151,458,100
1938	206,200	106,042,700
1939	214,000	125,223,000
1940 *)	90,500	60,010,000
1941 **)	58,700	34,991,900

*) War year. — **) Present boundaries, not including Thrace and Eastern Macedonia.

Hungary: Tobacco pricking was almost over by May 20. At that time, the condition of the plants was good.

About June 6, plants that had been transplanted early were developping well. In some places, the first weeding had begun.

Romania: The general agricultural plan, in the present season, foresees an increase of the area to tobacco. Legislative measures were taken to make the increase of area to this crop obligatory.

CURRENT INFORMATION ON HOPS.

Hungary: Towards May 20, hops were growing slowly. The crop suffered from the excessive cold of the winter and unfavourable weather in the Spring.

At the end of the first week in June, hops were growing well: its branches were strong.

CURRENT INFORMATION ON OTHER PRODUCTS.

Colza, Sesame, and other Oleaginous Crops.

Hungary: Towards May 20, colza had begun flowering. Crops are thin and low, except in the southern part of the Great Hungarian Plains (Alföld).

Towards June 6, the formation of colza husks was considered satisfactory and sunflower had sprouted regularly and was developping well.

Romania: At the middle of June, colza had ripened and harvest had begun.

Serbia: It is foreseen that the area sown to colza this year will be greatly increased. According to unofficial information, it may rach 37,000 acres.

Sweden: A survey on the culture of oleaginous plants shows that by the month of April had been sown about 32,100 acres to white mustard seed, 1,500 acres to poppies, 500 acres to Spring colza and some areas to sunflower. The increase of area to oleaginous plants seems to be about 100 per cent. as compared with last year.

CURRENT INFORMATION ON FODDER CROPS.

Denmark: Lucerne fields are generally in good condition and pastures have so increased in forage value that yields in milk have increased up to 60 per cent., even though no concentrated feed has been given milch animals. In some regions only, where cultures had been killed by frost, there is now as much scarcity of fodder as before. The favourable forage situation has induced many farmers to build sylos to store fodder for the winter. In some districts, labour is scarce, because many workmen have been induced by high salaries paid for the extraction of peet-moss to dedicate themselves to this work.

Finland: Weather conditions in the month of May were favourable to the vegetation of forage crops.

Hungary: Towards May 20, the condition of the forage beet crop was good. Clover, lucerne and the other Autumn fodder crops were, here and there, rather thin and generally infested by the deadly carrot. It may still be said that these crops are coming up satisfactorily, especially in the Trans-Danubian regions.

Fodder crops sown in the Spring are sprouting regularly and their growth is encouraging.

The growth of natural meadows and pastures was progressing well in the places that had not been flooded. In the north of the country conditions were good.

Good weather during the two weeks ending June 6, had a good influence on the development of all the fodder crops. At that time, clover and lucerne were developping generally well and cutting had begun. Autumn and Spring vetch was growing generally well and green fodder maize was about to sprout. Where free from floods, natural meadows also were developing well, and the first cutting was about to start. On the whole, pastures offer sufficient feed for cattle.

Sweden: According to press information, the heavy rains at the end of May were quite favourable to the growth of grass, so that pastures could be entirely utilised.

Cold and dry weather during the months of April and May did some damage to artificial meadows, whose crop condition at the beginning of June (expressed in the system of the country) was rated 2.9 against 2.2 at the corresponding date last year.

Switzerland: Under the influence of changing weather conditions, natural and artificial meadows have developed well. Yet damages due to frost and drought could not be entirely made up for, so that hay yields were scarce. In natural meadows the grass is not particularly thick; here and there the sod is lacking, owing to the fact that wetness came late. Abundant rains however have strongly stimulated vegetation and on meadows that have been fertilised at least in a certain measure, fodder of a good

quality and containing much clover will be cut. Artificial meadows appear generally in a good condition, and it may be counted on a good mean crop. Pastures promise a good yield.

Crop condition of natural meadows, according to the system of the country, was indicated by 76 at June 1, against 72 at May 1, 1942 and 63 at the first of June 1941. Artificial meadows were rated respectively as follows: 81, 75 and 73.

LIVESTOCK AND DERIVATIVES

ANIMALS SLAUGHTERED AND MEAT PRODUCTION IN BELGIUM.

Classification	1941	1940	1939	1938	1937	1936
I. — *Animals slaughtered* (number).						
Steers	84,751	86,623	82,658	79,243	77,787	82,032
Bulls	80,870	65,875	68,751	58,090	60,447	55,220
Cows	212,749	231,514	236,786	215,176	202,054	205,170
Heifers	150,339	145,548	154,612	150,088	147,899	145,825
Calves	113,031	278,843	371,440	336,028	372,517	379,761
Total cattle	*641,740*	*808,403*	*914,247*	*838,625*	*860,704*	*868,008*
Sheep	11,768	123,310	115,176	116,974	124,804	113,475
Lambs	506	8,470	12,073	10,152	12,444	15,566
Goats	355	2,961	6,169	9,527	13,755	16,213
Pigs	306,205	1,225,569	1,666,183	1,863,515	2,078,982	1,921,920
Horses	5,066	23,047	26,816	25,245	18,597	19,489
II. — *Quantity of meat* (thousand lb.)						
Meat from oxen	39,409	47,743	47,054	45,392	44,186	45,393
» » bulls	36,623	33,526	37,112	34,746	32,524	30,086
» » cows	104,415	124,392	129,565	121,069	113,617	114,298
» » heifers	62,183	70,077	75,857	73,414	72,699	68,404
» » calves	12,969	34,383	45,222	40,856	44,340	43,994
Total beef	*255,599*	*310,121*	*334,810*	*315,477*	*307,366*	*302,175*
Mutton	558	6,429	5,844	6,437	6,269	5,522
Lamb-meat	19	256	387	308	361	435
Goat-meat	10	96	199	285	376	409
Pork	42,074	218,346	311,628	344,363	381,477	357,509
Horse-meat	3,322	16,400	19,737	17,923	13,070	12,633
Total production of meat	*301,582*	*551,648*	*672,605*	*684,793*	*708,919*	*678,683*

ANIMALS SLAUGHTERED AND MEAT OBTAINED IN BULGARIA

SPECIFICATION	Animals slaughtered				Meat obtained			
	1941 (1)	1941 (2)	1940 (2)	1939 (2)	1941 (1)	1941 (2)	1940 (2)	1939 (2)
	number				Weight in thousand lb.			
Cattle	*151,921*	*149,653*	*123,763*	*140,410*	*40,435*	*39,754*	*36,781*	*34,561*
Calves under 1 year	35,378	35,280	13,537	35,311	5,460	5,445	2,255	4,336
Young bulls and heifers 1 year and under 3 years old	37,840	37,421	32,330	25,511	7,036	6,968	6,494	4,192
Oxen and bulls	48,933	47,899	47,200	43,811	19,757	19,344	19,443	16,500
Cows	29,770	29,053	30,696	35,777	8,182	7,997	8,589	9,533
Buffaloes	*35,818*	*34,808*	*30,050*	*33,225*	*10,000*	*9,704*	*9,259*	*8,864*
Young stock under 1 year	3,305	3,205	1,552	7,040	547	531	265	806
Young stock from 1 to 3 years old	13,523	13,228	9,530	6,720	2,420	2,363	1,882	1,157
Buffaloes und bulls	6,542	6,328	6,103	5,595	2,742	2,658	2,624	2,277
Buffalo-cows	12,448	12,047	12,865	13,870	4,291	4,152	4,488	4,624
Pigs	*102,491*	*99,521*	*70,721*	*87,277*	*21,162*	*20,643*	*14,928*	*16,738*
Sucking pigs und young pigs by weight to 20 kg.	176	176	122	3,308	4	4	3	74
Young pigs of 20 to 90 kg.	50,260	48,207	35,465	46,748	7,667	7,371	5,529	6,777
Other pigs of 90 kg. and over	52,055	51,138	35,134	37,221	13,491	13,268	9,396	9,887
Sheep	*1,824,014*	*1,762,359*	*1,610,610*	*1,624,228*	*34,239*	*33,186*	*31,836*	*32,038*
Lambs under 6 months	1,257,150	1,210,713	1,166,182	1,153,532	18,376	17,745	18,306	17,908
Lambs from 6 month to 1 year	90,442	90,168	59,242	84,815	1,698	1,693	1,246	1,725
Wethers and rams	58,619	55,941	54,878	67,456	2,179	2,090	2,120	2,605
Ewes	417,803	405,537	330,308	318,425	11,986	11,658	10,164	9,800
Goats	*107,242*	*105,097*	*95,729*	*127,083*	*2,130*	*2,079*	*1,900*	*2,666*
Kids under 6 months	68,581	67,227	69,075	85,876	936	916	957	1,249
Kids from 6 months to 1 year	9,163	9,112	3,784	7,584	140	139	58	126
He-goats, including castrated	3,643	3,565	2,867	3,541	147	143	140	177
She-goats	25,855	25,193	20,003	30,082	907	881	745	1,114
General total	—	—	—	—	**107,966**	**105,366**	**94,704**	**94,867**

(1) Figures relating to all towns of the Kingdom (former boundaries, 97 towns) and to 5 towns (Baltchik, Dobritch, Kavarna, Silistra and Toutrakan) of the Dobroudja incorporated in the region of Choumen. — (2) Figures relating to all towns of the Kingdom (former boundaries, 97 towns).

PIGS IN DENMARK *).

(Thousands)

CLASSIFICATION	1942 May 2	1942 March 21	1942 Feb. 7	1941 Dec. 27	1941 Nov. 15	1941 Oct. 4	1941 Aug. 23	1941 July 12	1941 May 30	1941 Apri) 19
Boars for breeding . . .	8	8	8	9	9	10	11	11	11	11
Sows in farrow for first time	37	27	20	23	28	44	57	78	74	64
Other sows in farrow .	61	60	67	69	68	79	86	85	87	87
Sows in milk	32	30	34	42	50	59	61	53	47	51
Sows not yet covered (and not for slaughter)	13	19	20	22	27	24	22	17	18	15
Sows for slaughter . . .	5	9	11	16	21	18	10	7	8	7
Total sows . . .	*148*	*145*	*152*	*172*	*194*	*224*	*236*	*240*	*234*	*224*
Sucking pigs not weaned	256	229	246	326	398	494	515	440	390	429
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg.	270	329	409	513	534	524	462	420	432	409
Pigs of 35 and under 60 kg.	276	327	387	424	416	401	399	405	366	419
Fat pigs of 60 kg. and over	204	229	266	247	374	360	317	254	288	333
Total pigs . . .	*1,162*	*1,267*	*1,468*	*1,691*	*1.925*	*2,013*	*1,940*	*1,770*	*1,721*	*1,825*

*) Rural districts only.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Bulgaria: In order to improve the quality and increase the production of wool and meat of indigenous sheep, the Ministry of Agriculture has issued a special decree regarding the crossing of the indigenous sheep with the race *Merinos*. The decree establishes in which regions crossings can be effectuated and fixes the number of selected indigenous sheep destined to them. The Ministry of Agriculture will also buy each year some selected indigenous lambs for reproduction and will sell them over to co-operatives and agricultural associations at very low prices, provided they engage themselves to effectuate these crossings. Sheep raisers who will effectuate the crossings according to the rules set by the Ministry of Agriculture will be granted a premium that may amount to even 40 per cent. of the market price for crossed sheep under three months of age. For wool of crossed sheep, delivered to the « Direction for the purchase and exportation of cereals », the latter will grant a premium that may reach even 30 per cent. of the market price, according to the quality and purity of the wool delivered. Sheep raisers that will deliver all the wool obtained from crossed stock, will receive by the Direction, at a low price, as much indigenous wool as may be needed for their personal use. Raisers that will effectuate crossings will be entitled to veterinary assistence for sick sheep free of cost. In order that all these measures may be successfully enforced, the Ministry of Agriculture is encouraging the organisation of raisers' co-operatives specially dedicated to sheep breeding.

Finland: The scarcity of fodder and the increased demand of meat have caused a strong reduction in the number of fowls which amounts to 1.5 million poultry head against 3.5 millions in normal times. The price of live poultry has gone up 100 finmarks in March and 225 finmarks in June.

Switzerland: According to the results of a survey made by the Information Bureau of the Swiss Farmers' Union, the delivery of milk to milk centrals in April 1942 amounted to 5 per cent. below that of the same month the year before. In April 1941 milk deliveries had already been 5 per cent. below those of the month of April 1940 and 8,7 per cent. below those of the month of April 1939. Compared with conditions before the war, the decrease is therefore quite considerable. This decrease is due to a reduction in the number of milch cows and to unfavourable feeding conditions.

CURRENT INFORMATION ON SERICULTURE.

Spain: The silk season this year has developped very well, and the cocoon production is estimated high.

Italy: According to information gathered until the middle of June, the silk season is going on favourably. Damage done by pests do not seem excessive. Generally, at the above date, silk worms were at their last age or ready to mounting. In some zones, cocoon delivery had already begun.

Brazil: The Ministry of Agriculture of Brazil is preparing to encourage the raising of cocoons on a large scale. Already existing rearing establishments will be improved and new ones will be set up.

PRODUCTION — LATEST INFORMATION

Argentina (Telegram July 1, 1942): Drought prevailing all over the country hinders wheat and flax sowings, while favouring maize harvest.

TRADE

PORTUGAL

Products and Units	April: Exports 1942	April: Exports 1941	April: Imports 1942	April: Imports 1941	Total from the beginning of the season *): Exports 1942 or 1941-42	Total from the beginning of the season *): Exports 1941 or 1940-41	Total from the beginning of the season *): Imports 1942 or 1941-42	Total from the beginning of the season *): Imports 1941 or 1940-41	Season: Total for Twelve Months *): Exports 1941 or 1940-41	Season: Total for Twelve Months *): Imports 1941 or 1940-41
Wheat: 1,000 centals	0	0	37	22	0	0	1,909	1,986	0	2,251
» : Thous. bush. of 60 lb.	0	0	61	37	0	0	3,181	3,311	0	3,752
Wheat flour: 1,000 centals	0	0	0	0	3	0	10	15	0	18
Wheat flour: Thous. bbl. of 196 lb. . .	0	0	0	0	2	0	5	8	0	9
Maize: 1,000 centals.	0	0	201	239	0	2	773	569	9	1,742
» : Thous. bush. of 56 lb.	0	0	358	427	0	4	1,381	1,016	17	3,111
Rice: 1,000 centals .	0	0	3	0	0	0	6	1	38	86
» : Thous. bush. of 45 lb.	0	0	7	1	0	0	12	2	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	11	0	11
» : Thous. bush. of 56 lb.	0	0	0	0	0	0	0	19	0	19
Cotton: 1,000 centals	0	0	58	75	0	0	400	296	0	427
» : Thous. bales of 478 lb.	0	0	12	16	0	0	84	62	0	89
Wool: 1,000 lb. . .	0	0	7	22	0	0	798	154	0	7,086
Butter: » » . .	24	31	0	0	93	75	0	0	313	0
Cheese: » » . .	22	26	0	4	108	99	0	26	317	37
Cacao: » » . .	0	0	75	90	4	0	1,021	1,301	119	2,597
Tea: » » . .	—	—	18	75	—	—	309	333	—	492
Coffee: » » . .	2	227	827	1,556	280	2,815	6,609	13,327	3,305	15,413

SWEDEN: Imports.

Products and Units		April 1942	April 1941	Total from the beginning of the season *) 1941-42	Total from the beginning of the season *) 1940-41	Total of the season *) 1940-41
Wheat	1,000 centals	75	0	86	277	277
	Thous. bush. of 60 lb.	124	0	144	461	461
Rye	1,000 centals	197	0	208	835	835
	Thous. bush. of 56 lb.	352	0	372	1,491	1,491
Oats	1,000 centals	0	1	53	171	695
	Thous. bush. of 32 lb.	0	2	166	535	2,172

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao, November 1st for maize.

CHILE

Products and Units	Exports 1941	Exports 1940	Products and Units	Imports 1941	Imports 1940
Oats . . . . 1,000 centals	462	753	Cotton . . . . 1,000 centals	159	118
Oats . . . . . Thous. bush. of 32 lb.	1,442	2,352	Cotton . . . Thous. bales of 478 lb.	33	25
Wool . . . . 1,000 lb.	25,508	24,240	Tea . . . . 1,000 lb.	4,742	4,894
			Coffee . . . . 1,000 lb.	18,537	19,149

COLOMBIA: Exports

Products and Units	Twelve Months January 1st-Dec. 31st 1941	1940
Coffee (1) . . . . 1,000 lb.	385,129	587,736

PERU: Exports

Products and Units	Twelve Months January 1st-Dec. 31st 1941	1940
Rice . . . . 1,000 centals	23	0
Rice . . . . Thous. bush. of 45 lb.	51	0
Cotton . . . . 1,000 centals	1,824	1,131
Cotton . . . . Thous. bales of 478 lb.	382	237
Wool . . . . 1,000 lb.	13,757	13,212
Coffee . . . . 1,000 lb.	6,900	3,346

ANGOLA: Exports

Products and Units	Twelve Months January 1st-Dec. 31st 1941	1940
Cotton . . . . 1,000 centals	95	78
Cotton . . . . Thous. bales of 478 lb.	20	16
Coffee . . . . 1,000 lb.	31,692	34,776

MOZAMBIQUE: Exports

Products and Units	Ten Months January 1st-October 30th 1941	1940
Cotton . . . . 1,000 centals	104	—
Cotton . . . . Thous. bales of 478 lb.	22	—
Tea . . . . 1,000 lb.	1,530	1,069

(1) January 1942: 51,021,752 lb.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	June 13, 1942	June 6, 1942	May 29, 1942	May 22, 1942	Monthly averages: May 1942	June 1941	June 1940	June 1939	June 1938
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery May	—	—	79 1/2	79 1/4	79 1/4	—	—	—	—
,, July	80 3/8	80 3/8	80 3/8	80 3/8	80 3/8	77 1/2	72 1/2	61 1/8	104 1/8
,, October	—	—	—	—	—	—	75	62 1/4	83 3/8
Chicago (cents. p. 60 lb):									
delivery July	118 7/8	117 1/4	119 1/8	120 1/8	122 1/8	102	78 3/4	73	74 7/8
,, September	121 3/8	119 7/8	121 3/4	122 5/8	124 1/2	103 1/2	79 3/4	73 5/8	76
,, December	124 5/8	122 3/4	124 7/8	125 1/2	* 125 1/8	105 1/8	80 1/8	74 7/8	77 1/2
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery May	—	—	61 1/2	61	62 1/2	—	—	—	—
,, July	56 1/4	56	62 1/4	61 5/8	63 3/8	58 3/4	45 3/8	44 7/8	53 5/8
,, October	57 1/2	57 1/2	63 5/8	63	64 5/8	56 1/4	43 7/8	45 3/4	53 5/8
Chicago (cents p. 56 lb.):									
delivery July	65 1/8	64 1/2	71 3/8	69 5/8	74 1/4	57	42 3/8	48 7/8	53
,, September	68	67 1/2	74 1/4	72 3/8	77 1/8	58 1/4	44 1/8	50 5/8	51 3/4
,, December	71 7/8	71 1/8	77 5/8	76	79 5/8	60 7/8	46 1/4	52 1/2	53 3/8
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery May	—	—	64 3/4	64 3/4	64 3/4	—	—	—	—
,, July	64 3/4	64 3/4	64 3/4	64 3/4	64 3/4	50 5/8	34 7/8	37 7/8	55 1/8
,, October	63 5/8	63 1/4	63 1/2	63 5/8	63 5/8	45 7/8	35 1/2	37 5/8	49 1/2
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery May	—	—	51 1/2	51 1/2	51 1/2	—	—	—	—
,, July	51 1/2	51 1/2	51 1/2	51 1/2	51 1/2	38 5/8	30 5/8	29 1/2	45
,, October	50	49 3/8	49 1/2	49 3/8	50 1/8	35 1/4	28 1/4	29 1/8	37 1/4
Chicago (cents p. 32 lb.):									
delivery July	48 3/4	48	50 1/4	50 5/8	53 3/4	36 1/2	32	33	26 3/4
,, September	49 1/2	49	50 1/2	52	54 1/4	37 1/4	30 1/8	31 1/2	26 1/4
,, December	51 3/4	50 3/4	51 3/4	—	—	38 1/2	30 3/8	32 3/8	27 3/8
Maize.									
Chicago (cents p. 56 lb.):									
delivery July	86 1/8	85 7/8	87 1/8	86 7/8	88	73 5/8	62 1/8	49 3/8	57 1/2
,, September	88 7/8	88 3/8	89 5/8	89 1/8	90 1/4	75 5/8	60 1/2	50 7/8	58 5/8
,, December	91 1/4	90 5/8	92 1/8	91 5/8	* 92 7/8	77 5/8	58 1/4	51 3/4	57 1/2
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery May	—	—	164	164	164	—	—	—	—
,, July	164	164	164	164	164	153 1/2	144 1/8	144 1/8	142 3/4
,, October	164	164	164	164	164	150 3/8	148 1/2	141	143

* Indicates that the product was not quoted during part of the period under review.

INDEX-NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS AND OF COMMODITIES BOUGHT BY THE FARMER

Description	March 1942	Feb. 1942	Jan. 1942	Dec. 1941	Nov. 1941	Oct. 1941	March 1941	March 1940	Year 1940-41 (3)	Year 1939-40 (3)
Germany										
(Statistisches Reichsamt; products sold by farmers) Average for corresponding months 1909-10/1913-14 = 100.										
Cereals	114	114	113	114	113	112	114	112	111	111
Edible potatoes	115	116	121	127	118	108	114	114	118	115
Plant products	114	114	114	115	114	110	114	112	113	112
Meat animals	108	107	106	105	100	98	99	99	99	98
Livestock products (butter and eggs)	121	120	123	121	119	118	120	116	126	118
Livestock and livestock products	112	111	111	110	105	104	106	104	107	104
Total agricultural products	112	112	112	112	108	106	108	106	109	106
Germany										
(Statistisches Reichsamt; wholesale products) 1913 = 100.									1941	1940
Agricultural products	112.7	112.6	113.7	113.1	111.8	111.4	111.3	110.1	112.4	110.7
Fertilizers	55.7	55.7	55.2	53.0	52.2	53.2	56.1	55.3	53.9	53.1
Consumption goods (1)	148.1	146.9	147.0	146.9	147.0	146.8	147.4	138.5	146.9	141.6
Wholesale products in general	113.6	113.4	113.7	113.1	112.4	112.2	111.7	109.4	112.2	110.0
Argentina										
(Banco Central de la República Argentina) 1926 = 100.										
Cereals and linseed	60.5	...	...	60.2	61.3	61.6	59.8	75.2	60.3	68.8
Meat	121.5	...	...	102.4	101.0	104.2	99.6	104.9	102.4	102.9
Hides and skins	119.5	...	...	126.4	117.4	107.0	99.6	111.8	103.4	92.1
Wool	121.7	...	...	120.2	125.7	123.8	99.6	146.7	110.5	116.6
Dairy products	71.0	...	...	98.2	119.4	111.6	76.0	77.2	98.4	82.0
Forest products	121.5	...	...	121.5	121.5	121.6	118.7	116.1	120.2	112.8
Total agricultural products	80.1	...	...	78.6	79.4	78.8	73.3	88.6	75.9	80.4
Non-agricultural commodities	206.1	...	...	194.3	189.5	185.9	141.7	133.6	163.4	135.4
Wholesale products in general	179.0	...	...	169.4	165.9	162.9	127.1	124.1	144.7	123.4
Denmark										
(Det landökonomiske Driftsbureau) Average 1909 to 1914 = 100										
Cereals	216	216	216	216	216	216	207	155	210	179
Total plant products (2)	268	261	262	252	254	256	243	183	248	210
Dairy products	221	221	221	216	216	216	220	125	216	156
Total animal products (2)	227	225	226	226	225	222	214	135	219	161
Total agricultural products	230	228	228	228	227	225	216	138	221	165
Fertilizers	166	165	167	171	170	170	173	123	170	134
Concentrated feedingstuffs	—	—	—	—	—	—	—	—	—	187
Seeds	366	366	366	238	238	238	238	141	235	141
Total products purchased	—	—	—	—	—	—	—	—	—	171

(1) Household goods of all kinds, and clothing. (2) — Including non-specified products. — (3) Agricultural year: July 1-June 30.

Description	March 1942	Feb. 1942	Jan. 1942	Dec. 1941	Nov. 1941	Oct. 1941	March 1941	March 1940	Year 1941	Year 1940
Hungary										
(Central Royal Bureau of Statistics) 1929 = 100.										
Cereals	132.1	132.1	132.1	132.1	132.1	132.1	105.5	91.2	118.5	96.2
Total raw plant products (¹)	140,0	135.0	134.5	131.8	129.7	128.8	115.7	92.1	122.7	101.9
Meat animals, meat and lard	133.4	134.0	133.0	132.7	132.5	133.8	104.3	76.3	122.9	87.1
Total livestock products (¹)	126,4	126.8	124.5	124.3	123.9	124.7	100.3	76.2	114.2	85.1
Total agricultural products	135.7	132.4	131.4	129.4	127.8	127.5	110.9	87.1	120.0	96.7
Products of agricultural industries	150,8	150.8	150.8	150.8	141.0	141.0	107.9	96.3	125.0	101.0
Industrial raw materials and products.	148,7	146.9	143.9	139.6	137.3	134.6	114.3	97.4	123.3	102.3
Wholesale products in general.	144,4	142.2	140.3	137.4	134.5	133.1	112.7	93.6	122.7	100.3
Norway									1940-41 (²)	1939-40 (²)
(Landbrukshöiskole) Average 1909 to 1914 = 100										
Plant products	261	261	257	254	254	246	226	218	229	168
Pork	231	231	231	231	231	231	205	143	172	144
Other meat	270	270	270	270	270	270	270	182	226	172
Dairy products	248	246	246	242	245	247	236	192	215	173
Eggs	227	227	221	221	221	221	185	156	161	122
Livestock products	247	246	246	243	245	246	233	180	206	165
Total agricultural products	250	250	248	246	247	246	232	188	211	166
Superphosphate, 16 %	189	189	189	189	189	184	184	184	192	141
Potash salt, 40 %	121	121	121	115	115	118	118	111	117	109
Nitrate of lime, 15 ¹/₂ %	79	79	79	79	79	83	81	81	82	78
Feedingstuffs for milk production	247	247	247	247	246	246	246	186	227	167
Feedingstuffs for pork production	—	—	—	—	—	—	—	177	—	157
Building materials	239	239	239	238	236	236	224	202	210	183
Machinery and implements	302	302	302	302	302	302	261	232	250	219
Total production goods bought	238	238	238	238	237	237	228	190	214	174
Consumption goods bought	292	292	292	285	284	283	264	207	232	184
Total goods for production and consumption bought	261	261	258	258	257	257	243	197	222	178
Agricultural wages.	...	...	...	...	...	...	238	215	238	21
Norway										
(Kgl. Selskap for Norges Vel) Average 1909-1914 = 100.										
Cereals	257	257	257	257	257	257	213	175	195	168
Potatoes	279	279	259	259	259	263	250	297	282	186
Pork	248	248	248	248	248	248	218	144	177	141
Other meat	265	265	265	265	265	265	265	174	217	168
Dairy products	219	219	219	219	219	219	219	198	208	186
Eggs	233	233	233	233	233	233	195	164	169	129
Concentrated feedingstuffs	201	201	201	201	201	214	214	177	285	163
Maize	—	—	—	—	—	—	—	179	194	165
Fertilizers	106	106	106	99	102	123	122	121	127	101

(¹) Including unspecified products. — (²) Agricultural year: April 1 to March 31.

Description	March 1942	Feb. 1942	Jan. 1942	Dec. 1941	Nov. 1941	Oct. 1941	March 1941	March 1940	Year 1940-41 (1)	Year 1939-40 (1)
Netherlands										
(Bureau of Agriculture) Average 1924-25 to 1928-29 = 100.										
Plant products	91	89	88	87	89	89	80	73	79	69
Livestock products	112	101	97	96	93	95	96	77	89	71
Total agricultural products	107	98	95	94	92	93	93	76	87	70
Agricultural wages	...	...	...	...	...	...	86	75	86	77
Sweden										
(Sveriges Lantbruksförbund) Average 1935-1937 = 100									1941	1940
Bread cereals	...	...	...	171.4	171.4	171.4	...	...	161.9	134.2
Barley	...	...	...	171.6	174.9	174.9	165.2	118.5	169.7	141.1
Oats	...	...	...	169.6	173.3	173.3	172.9	131.8	172.7	152.2
Dry peas	...	...	...	220.8	220.8	220.8	229.7	176.7	226.0	191.1
Edible potatoes	...	...	...	155.5	150.2	151.1	130.4	213.1	167.8	172.0
Potatoes for industrial purposes	...	...	...	174.8	171.3	167.5	167.5	134.7	167.5	140.1
Sugarbeets	...	...	...	174.3	174.3	174.3	128.1	114.6	151.2	121.4
Hay	...	...	...	271.9	271.9	271.9	362.5	134.0	315.6	220.1
Milk for liquid consumption, to be sold	...	...	...	(2) 170.5	(2) 159.1	(2) 159.1	(2) 161.3	128.6	(2) 159.4	137.2
Milk for liquid consumption on the farm	...	...	...	174.5	162.8	162.7	158.7	128.1	160.6	136.5
Butter	...	...	...	168.8	168.5	168.3	163.5	131.3	164.6	139.5
Cheese	...	...	...	—	—	—	158.1	124.9	—	136.5
Total dairy products	...	...	...	(2) 189.0	(2) 181.6	(2) 182.6	174.8	135.5	(2) 176.0	145.7
Eggs	...	...	...	202.7	205.0	174.7	192.1	125.6	173.3	127.8
Full-grown cattle	...	...	...	194.8	193.7	193.7	175.9	127.7	183.9	132.7
Big calves	...	...	...	191.3	192.6	191.3	173.6	132.7	181.0	138.3
Small calves	...	...	...	174.4	161.9	161.9	176.7	125.7	161.8	123.8
Sheep	...	...	...	178.3	172.3	173.0	208.6	155.5	189.4	151.3
Pigs	...	...	...	174.0	173.1	172.2	157.7	120.8	167.3	135.0
Chemical fertilizers and chalk	...	...	...	136.5	136.1	136.1	135.7	123.4	135.8	125.1
Feedingstuffs bought	...	...	...	141.2	141.2	141.2	124.9	125.4	130.4	125.7
Machinery and implements	...	...	...	144.5	144.5	144.5	143.4	124.5	144.0	126.7
Costs in relation with tractors	...	...	...	314.2	313.7	313.7	306.3	151.1	293.7	168.4
Cost of maintenance and amortisation of agricultural buildings	...	...	...	(2) 150.1	149.3	148.6	142.0	131.1	(2) 145.7	134.6
Sundry costs	...	...	...	(2) 183.5	(2) 184.0	(2) 183.6	(2) 174.8	131.6	(2) 176.5	141.6
Cost of soil improvement	...	...	...	153.4	153.4	153.4	143.7	132.1	148.3	135.7
Agricultural wages	...	...	...	158.2	155.3	155.0	146.4	132.8	151.5	138.2
Interest of capital	...	...	...	(2) 94.8	(2) 94.8	(2) 94.8	99.3	96.0	(2) 96.9	98.4
Switzerland										
(Schweizerischer Bauernverband) 1914 = 100.										
Slaughter cattle	189	187	184	179	179	175	134	119	159	128
Slaughter pigs	240	239	226	226	226	224	194	143	212	154
Milk (base price)	159	159	159	159	159	147	147	128	149	135
Total agricultural products	188	187	184	183	182	177	158	134	176	144
Feedingstuffs (3)	202	202	201	200	199	199	183	132	194	146
Fertilizers (3)	145	145	145	128	128	128	126	105	127	113
Wholesale products in general (3)	206.6	204.8	201.8	198.7	197.6	192.8	170.2	132.1	183.5	143.0

(1) Agricultural year: July 1 to June 30. — (2) Provisional figure. — (3) Index numbers calculated by the Bundesamt für Industrie, Gewerbe und Arbeit; base July 1914.

APPENDIX

DISTRIBUTION OF CATTLE ACCORDING TO AGE, SEX AND DESTINATION

by VALENTINO DORE

It is the intention of the International Institute of Agriculture to actively resume, as soon as circumstances will allow, its action for the perfecting and unification of agricultural statistics. At present it seems fit, in view of future action, to begin treating some particular aspects of this complex problem and thus prepare a preliminary base for the discussions and decisions which, in due time, the official statisticians of the interested countries may be called to undertake and reach.

The following paper, prompted by this program, takes up the question of the classification of cattle in the statistics of livestock.

1. — Nearly all countries of the world, either every year or from time to time, set up their statistics on the number of livestock existing at a certain date. Many among these countries, do not limit themselves to register the total figures for each kind, but they also furnish details on sex, age and destination, and sometimes even on the race of animals.

The number and nature of these details differ considerably according to countries, in relation to the importance which the respective Governments attach to their livestock statistics and to the possibilities of their administrative organisation. If the variety of present conditions does not allow looking upon the possibility that the classifications of all countries be as complete as those of them where details are more numerous, it would still be extremely useful, for the sake of international comparison, that at least some fundamental ones were adopted everywhere on a uniform base.

For the principal kinds, the International Institute of Agriculture has set up a minimum classification, which appears in the "Standard Form of Schedule" prepared by the two Conferences of Agricultural Statisticians for the study of the program of the World Agricultural Census that took place in Rome in October 1936 and in December 1937, and were attended by the experts of a large number of countries.

It is now our purpose to examine here up to what point the elements furnished by existing statistics in a series of countries lend themselves to be grouped according to the minimum classification proposed for cattle.

2. — For animals belonging to the cattle kind, the Census program suggested the following categories:

Calves under one year of age,
Young cattle, males,
Young cattle, females,
Cows, mainly or exclusively for milk production,
Cows, other,
Bulls,
Oxen (over 2 years old).

As may be seen, the classification is based only in part on the age of the animals, viz., in order to establish the limit (1 year) between calves and young cattle, and between young male cattle and oxen. The distribution between young male cattle and bulls and between young female cattle and cows, on the contrary, is based on a criterion of a physiological order: young male cattle must be considered as bulls if they have already been or may be utilised for service, females are to be considered as cows when already calved. This criterion has seemed preferable to that of a general classification by age, such as is in force in many countries and had been adopted in the program of the First Agricultural Census. In reality, what is interesting to know is the grouping of livestock according to its economic destination, which cannot be easily defined in the case of young animals, while it results quite clearly in the case of adult ones. Now, classification by age gives the desired indication only in quite an imperfect manner, because a rigid age limit between young male cattle and bulls, young female cattle and cows is arbitrary, and may not correspond to the real situation when animals of different races and countries are to be classified. And besides, from a practical point of view, in many cases is not easy to know *exactly* the age of enumerated animals.

3. — In Table 1 the attempt has been made to include in the "Standard classification" (1) mentioned above, the available data for 42 countries.

The most recent statistics were generally adopted. When for the most recent years details were lacking or less complete, previous statistics were recurred to.

The fact that data refer to different years does not seem such as to compromise the value of comparisons between the figures of the different countries: in fact in the case of cattle, the distribution by sex and age in a country is generally quite constant and, except for extraordinary cases, it does not show any important variation within a short period of years. Nor (contrary to what happens for other kinds of livestock) can the time of the year to which statistics refer, have a very considerable influence on the composition of cattle.

(1) We have given up the distinction between « cows, mainly or exclusively for milk production » and « cows, other », as this distinction does not figure in most of the countries surveyed.

TABLE I. — *Distribution of cattle (head).*

COUNTRY	Date	Calves (under 1 year old)	Young Stock: Males	Young Stock: Females	Cows	Bulls	Oxen (over 2 years old)	Total
Germany	Dec. 1937	4,925,570	754,540	3,617,997 [1] 2,578,917	10,351,223 [2] 11,390,303	[3] 190,578	[4] 663,677	20,503,585
Austria	June 1930	434,147	...	332,954 [1] 242,355	1,207,137 [2] 1,297,736	[5] 78,764	[5] 259,847	2,312,849
Belgium	May 1941	627,506	73,946	377,495 [1] 249,483	842,213 [2] 970,225	[3] 28,569	[4] 34,921	1,984,650
Bulgaria	Dec. 1934	226,896	[6] 66,854	[6] 57,332	[7] 533,003	[7] 4,748	[7] 608,791	1,497,624
Denmark	July 1939	851,884	...	[1] 658,673	[2] 1,613,725	[5] 68,521	[5] 78,079	3,270,882
Spain	July 1938	1,010,200	344,500	526.500	1,632,500	48,300	177,300	3,739,300
Estonia	June 1939	107,655	...	92,946	480,380	[5] 25,150		706,131
Finland	Sept. 1938	302,264	[8] 33,411	228,779	1,367,766	[9] 21,681		1,953,901
France	Nov. 1929	3,317,334	1,052,805	2,098,503	8,544,812	210,320	1,287,082	16,510,856
Hungary	spring, 1938	...	[10] 347,896	[11] 629,686 [12] 397,530	1,100,644 [2] 1,332,800	[9] 29,808	263,534	2,371,568
Ireland	June 1939	1,025,723	[13] 1,010,971		[14] 1,260,187	24,809	[15] 735,648	4,057,338
Italy	Mar. 1930	1,734,301	...	808,987	3,530,983	[5] 143,448	[5] 871,033	7,088,752
Latvia	June 1939	195,400	[8] 23,500	152,500	890,200	[9] 10,200		1,271,800
Lithuania	Dec. 1939	206,700	...	...	[14] 744,590	[16] 192,600		1,143,890
Luxembourg	Oct. 1939	27,138	[8] 5.930	[1] 10,956	[2] 61,442	[9] 943	1,008	107,417
Norway	June 1939	329,329	[8] 74,584	172,686	864,336	[4] 14,081		1,455,016
Netherlands	May 1939	544,822	...	550,383	1,566,281	[5] 38,383	[5] 117,445	2,817,314
Poland	June 1938	1,520,122	[6] 254,318	1,364.847	7,237,246	[7] 65,451	[7] 111,473	10,553,457
Portugal	Dec. 1934	279,217	...	415.074		[5] 210,906		905,197
Romania	1938		894,294		[2] 2,292,901	[9] 53,739	920,122	4,161,056
United Kingdom:								
England and Wales	Dec. 1938	[17] 1,346,000	[18] 1,762,000		[14] 2,710,000	[19] 149,000	[20] 882,000	6,849,000
Scotland	Dec. 1938	[17] 276,900	[18] 396,500		[14] 442,100	[19] 29,800	[20] 206,600	1,351,900
Northern Ireland	Jan. 1939	[17] 185,998	[18] 196,963		[14] 238,709	[19] 4,497	[20] 74,397	700,564
Sweden	Sept. 1937	465,565	58,236	504,839	1,921,396	27,272	8,959	2,986,267
Switzerland	April 1941	326,214	[8] 37,629	340,953	826,415	[9] 7,942	8,617	1,583,770
Czechoslovakia	Jan. 1938	1,148,308	[8] 289,499	656,590 [1] 502,451	2,559,998 [2] 2,714,137	[9] 40,151	243,587	4,938,133
Yugoslavia	Dec. 1939	581,119	[1] 636,604		[2] 1,983,665	[9] 61,477	961,730	4,224,595
U. S. S. R.	Jan. 1935	10,457,900	[8] 1,337,100	4,956,300 [1] 2,999,000	19,031,300 [2] 20,988,600	[9] 435,100	2,651,600	[21] 38,869,300
Canada	June 1939	1,936,800	[22] 1,232,200		4,403,300	[5] 256,100	646,200	8,474,600
United States	Jan. 1940	16,838,000	...	[1] 8,870,000	[2] 36,052,000	[5] 1,623,000	[5] 5,386,000	68,769,000
Argentina	June 1937	7,439,911	[8] 3,649,345	[1] 4,144,284	[2] 14,376,765	[9] 690,179	2,638,483	[23] 32,938,967
Chile	June 1930	419,656	[6] 417,057	[6] 266,486	[7] 730,530	[7] 29,042	[5] 525,169	2,387,940
Uruguay	May 1937	1,627,883	[8] 953,407	[6] 1,219,769	[7] 3,163,173	[9] 120,742	1,211,916	8,296,890
Burma	1938-39		952,547		1,439,525	696,543	2,105,228	5,193,843
India: British Prov.	1937-38		34,028,876		37,051,633	48,599,758		119,680,267
India: Indian States	1936-37		12,514,752		14,044,488	14,271,232		40,830,472
Japan	Dec. 1938	260,721	[8] 115,921	[1] 195,378	[2] 1,087,558	[7] 234,683		1,894,261
Turkey	1927	1,105,106	746,018		2,301,545	162,724	2,616,089	6,931,482
Egypt	Mar. 1937	207,204	[6] 56,024	[6] 122,707	[7] 489,700	[7] 107,584		983,219
French Morocco	1938		406,868			1,505,496		1,912,364
Union of South Africa [24]	1937	1,034,205	[8] 473,366	[1] 627,205	[2] 2,169,927	[9] 75,211	1,816,846	6,196,760
Australia	Dec. 1937	...	...	...	[14] 3,213,797	...	...	13,078,356
New Zealand	Jan. 1939	786,937	[8] 221,012	[1] 518,353	[2] 2,591,069	[9] 77,546	370,031	4,564,948

[1]) From 1 to 2 years. — [2]) 2 years and over. — [3]) Not including bulls not used for service. — [4]) Including bulls not used for service. — [5]) Including young stock. — [6]) From 1 to 3 years. — [7]) 3 years and over. — [8]) Including bulls under 2 years. — [9]) Not including bulls under 2 years. — [10]) Under 2 years, including calves (males). — [11]) Including calves (females). — [12]) Under 2 years, including calves (females). — [13]) From 1 to 2 years, including young bulls and heifers in calf. — [14]) Milch cows. — [15]) Cattle 2 years old and over other than bulls for service, heifers in calf and milch cows. — [16]) Cattle 1 year old and over other than milch cows). — [17]) Not including bull calves being reared for service. — [18]) Cattle from 1 to 2 years, other than bulls being reared for service, and heifers in calf — [19]) Including bulls and bull calves being reared for service. — [20]) Cattle 2 years old and over other than bulls for service, heifers in calf, cows in calf but not in milk and cows in milk. — [21]) Not including 21,000 animals in transit, unclassified. — [22]) Not including young bulls. — [23]) Not including 268,320 animals, unclassified. — [24]) Cattle owned by Europeans.

The most serious difficulty in the way of international comparisons is due rather to the difference between the classification systems and the definition of some categories.

The large quantity of notations that had to be introduced in the Table shows immediately that in many cases the figures appearing in the same column are not homogeneous.

4. — The column that registers the largest number of comparable data is that dealing with calves under one year of age.

The proportion of animals under 1 year old as compared with the total number of cattle, varies between a minimum of less than 14 per cent. and a maximum of more than 31 per cent. This proportion, for each one of the countries where this category is classified separately, is as follows:

TABLE II. — *Proportion in per cent. of the number of calves under 1 year old in relation to the total number of cattle.*

COUNTRIES	Percentages	COUNTRIES	Percentages	COUNTRIES	Percentages
Belgium	31.6	Canada	22.9	Chile	17.5
Portugal	30.8	Norway	22.6	New Zealand	17.2
Spain	27.0	Argentina	22.6	Union of South Africa	16.7
U. S. S. R.	27.0	Egypt	21.1	Turkey	15.9
Northern Ireland	26.5	Switzerland	20.6	Sweden	15.6
Denmark	26.1	Scotland	20.5	Finland	15.5
Ireland	25.3	France	20.1	Latvia	15.4
Luxembourg	25.3	England and Wales	19.7	Bulgaria	15.2
United States	24.5	Uruguay	19.6	Estonia	15.2
Italy	24.5	Netherlands	19.2	Poland	14.4
Germany	24.0	Austria	18.8	Japan	13.8
Czechoslovakia	23.3	Lithuania	18.1	Yugoslavia	13.7

5. — As regards the other categories, comparisons appear more difficult on account of the lack of uniformity in the classification systems adopted by the different countries.

Data for a certain number of countries make it possible to establish a net distinction between heifers, i. e., females of a year or more that have not yet calved and cows. For other countries, one must be satisfield with the distinction between females from 1 to 2 years old and those of 2 years and over; for other countries still, one finds a distinction between females from 1 to 3 years and those 3 years old and over. It is interesting to find that, in some countries, the details furnished by the statistics make it possible to distribute females of 1 year and over either according to the physiological criterion (heifers and cows) or according to age (females from 1 to 2 years and females of 2 years and over), and to know thus exactly the difference of the results which are reached by employing one or the other criterion.

The relative importance, in relation to the total number of cattle, of females distributed into heifers and cows, or else into animals from 1 to 2 years old and animals 2 years old and over (in some cases, animals from 1 to 3 years and animals 3 years old and over), is shown by Table III.

TABLE III. — *Proportion in per cent. of the number of females 1 year old and over in relation to the total number of cattle.*

COUNTRIES	Heifers	Cows	Females 1 to 2 years old	Females 2 years old and over	Total females 1 years old and over
Germany	17.7	50.5	12.6	55.6	68.2
Austria	14.4	52.2	10.5	56.1	66.6
Belgium	19.0	42.5	12.6	48.9	61.5
Bulgaria	—	—	(1) 3.8	(2) 35.6	39.4
Denmark	—	—	20.1	49.3	69.4
Spain	14.1	43.7	—	—	57.8
Estonia	13.2	68.0	—	—	81.2
Finland	11.7	70.0	—	—	81.7
France	12.7	51.7	—	—	64.4
Hungary	(3) 26.5	46.4	(3) 16.7	56.2	(3) 72.9
Ireland	...	(4) 31.1	—	—	...
Italy	11.4	49.8	—	—	61.2
Latvia	12.0	70.0	—	—	82.0
Lithuania	...	(4) 65.1	—	—	...
Luxembourg	—	—	10.2	57.2	67.4
Norway	11.9	59.4	—	—	71.3
Netherlands	19.5	55.6	—	—	75.1
Poland	12.9	68.6	—	—	81.5
Portugal	—	—	—	—	45.9
Romania	—	—	...	55.1	...
United Kingdom:					
England and Wales	...	(4) 39.6	—	—	...
Scotland	...	(4) 32.7	—	—	...
Northern Ireland	...	(4) 34.1	—	—	...
Sweden	16.9	64.3	—	—	81.2
Switzerland	21.5	54.5	—	—	76.0
Czechoslovakia	13.3	51.8	10.1	55.0	65.1
Yugoslavia	—	—	...	46.9	...
U. S. S. R.	12.7	49.0	7.7	54.0	61.7
Canada	...	52.0	—	—	...
United States	—	—	12.9	52.4	65.3
Argentina	—	—	12.6	43.6	56.2
Chile	—	—	(1) 11,2	(2) 30.6	41.8
Uruguay	—	...	(1) 14.7	(2) 38.1	30.6
Burma	...	27.7	—	—	...
India: British Provinces	...	31.0	—	—	...
India: Indian States	...	34.4	—	—	...
Japan	—	—	10.3	—	67.7
Turkey	...	33.2	—	57.4	...
Egypt	—	—	(1) 12.5	(2) 49.8	62.3
Union of South Africa	—	—	10.1	35.0	45.1
Australia	...	(4) 24.6	—	—	...
New Zealand	—	—	11.4	56.8	68.2

(1) Females from 1 to 3 years old. — (2) Females 3 years old and over. — (3) Including calves (females) under 1 year old. — (4) Milch cows.

6. — In Table IV is shown the relative importance, in relation to the total number of cattle, of male animals 1 year old and over, distributed, as far as possible, into three categories: Young stock (young oxen under 2 years and young bulls not ready for service) bulls, and oxen 2 years old and over.

TABLE IV. — *Proportion in per cent. of the number of males 1 year old and over in relation to the total number of cattle.*

Countries	Young Stock	Bulls	Oxen	Total males 1 year old and over
Germany	3.7	0.9	3.2	7.8
Austria	...	(1) 3.4	(1) 11.2	14.6
Belgium	3.7	1.4	1.8	6.9
Bulgaria	(2) 4.5	(3) 0.3	(3) 40.6	45.4
Denmark	...	(1) 2.1	(1) 2.4	4.5
Spain	9.2	1.3	4.7	15.2
Estonia	...	...	...	3.6
Finland	1.7	1.1		2.8
France	6.4	1.3	7.8	15.5
Hungary	(5) 14.7	1.3	11.1	(5) 27.1
Italy	...	(1) 2.0	(1) 12.3	14.3
Latvia	1.8	0.8		2.6
Luxembourg	5.5	0.9	0.9	7.3
Norway	5.1	1.0		6.1
Netherlands	...	(1) 1.4	(1) 4.2	5.7
Poland	(2) 2.4	(3) 0.6	(3) 1.1	4.1
Portugal	...	...	...	23.3
Romania	...	1.3	22.1	(4) 23.4
Sweden	2.0	0.9	0.3	3.2
Switzerland	2.4	0.5	0.5	3.4
Czechoslovakia	5.9	0.8	4.9	11.6
Yugoslavia	...	1.5	22.8	(4) 24.3
U. S. S. R.	3.4	1.1	6.8	11.3
Canada	...	3.0	7.6	(4) 10.6
United States	...	(1) 2.4	(1) 7.8	10.2
Argentina	11.1	2.1	8.0	21.2
Chile	(2) 17.5	(3) 1.2	(3) 22.0	40.7
Uruguay	(2) 11.5	(3) 1.5	(3) 14.6	27.6
Burma	...	13.4	40.5	(4) 53.9
India: British Provinces	...	40.6		(4) 40.6
India: Indian States	...	35.0		(4) 35.0
Japan	6.1	12.4		18.5
Turkey	10.8	2.3	37.8	50.9
Egypt	(2) 5.7	10.9		16.6
Union of South Africa	7.6	1.2	29.4	38.2
New Zealand	4.8	1.7	8.1	14.6

(1) Including young stock. — (2) Males 1 to 3 years old. — (3) Males 3 years old and over. — (4) Not including young stock. — (5) Including calves under 1 year old.

7. — As it results from the data included in the preceding tables, the grouping of figures of the different countries according to the " Standard Form of Schedule " of the World Agricultural Census is only possible, in many cases, in a partial measure and in an imperfect manner.

For a greater number of countries, more satisfactory results may be obtained if one limits himself to consider only three great categories, viz., on one side calves (under 1 year old) and on the other side, males and females 1 year old and over, respectively. These results are registered in Table V, in which, however, it has been impossible to include countries that make no distinction of the young stock according to sex, or put together cows other than milch cows and oxen, as is the case of Ireland, Lithuania, England and Wales, Scotland, Northern Ireland.

TABLE V. — *Proportion in per cent. in relation to the total number of cattle.*

Countries	Calves under 1 year old	Females 1 year old and over	Males 1 year old and over
Germany	24.0	68.2	7.8
Austria	18.8	56.6	14.6
Belgium	31.6	61.5	6.9
Bulgaria	15.2	39.4	45.4
Denmark	26.1	69.4	4.5
Spain	27.0	57.8	15.2
Estonia	15.2	81.2	3.6
Finland	15.5	81.7	2.8
France	20.1	64.4	15.5
Hungary	...	(1) 72.9	(1) 27.1
Italy	24.5	61.2	14.3
Latvia	15.4	82.0	2.6
Luxembourg	25.3	67.4	7.3
Norway	22.6	71.3	6.1
Netherlands	19.2	75.1	5.7
Poland	14.4	81.5	4.1
Portugal	30.8	45.9	23.3
Romania	...	(2) 55.1	(2) 23.4
Sweden	15.6	81.2	3.2
Switzerland	20.6	76.0	3.4
Czechoslovakia	23.3	65.1	11.6
Yugoslavia	13.7	(2) 46.9	(2) 24.3
U. S. S. R.	27.0	61.7	11.3
Canada	22.9	(2) 52.0	(2) 10.6
United States	24.5	65.3	10.2
Argentina	22.6	56.2	21.2
Chile	17.5	41.8	40.7
Uruguay	19.6	52.8	27.6
Burma	...	(2) 27.7	(2) 53.9
India: British Provinces	...	(2) 31.0	(2) 40.6
India: Indian States	...	(2) 34.4	(2) 35.0
Japan	13.8	67.7	18.5
Turkey	15.9	(2) 33.2	(2) 50.9
Egypt	21.1	62.3	16.6
Union of South Africa	16.7	45.1	38.2
New Zealand	17.2	68.2	14.6

(1) Including calves under 1 year old. — (2) Not including young stock.

8. — The statistical elements that have been gathered may appear interesting in themselves, in so far as they define some characteristical aspects of stock raising in various types of countries, such as the strong prevalence of the number of females 1 year old and over in the countries that are large producers of milk (Baltic and Scandinavian countries, Poland, the Netherlands) and the comparatively large proportion of males 1 year old and over in the countries where cattle is widely used for agricultural work (Burma, India, Turkey, Bulgaria, Yugoslavia, Romania, Union of South Africa), or else where the rearing of young oxen and oxen for the production of meat is done on a large scale (Argentina, Chile, Uruguay).

This paper, however, which, as was said above, aims at presenting a peculiar aspect of the problem of the unification of agricultural statistics, means chiefly

to emphasize the differences still existing between the classification systems of cattle statistics in the different countries. It would seem that in many cases these differences could be done away with even without modifying the present structure of national classifications, by simply adding to them some complementary subdivisions. Thus, for instance, the countries that subdivide females other than cow-calves into two categories from 1 to 2 years and from 2 years and over, might simply register heifers (covered or not) separately in this last category in order that their classification system could be made to agree with the international system. By the same token, the countries that include within one category the animals of each sex aged from 1 to 3 years, would have simply to register separately heifers, young oxen from 1 to 2 years and young bulls already used or that may be used for service.

The number of countries that would have to introduce more radical changes in their classification methods in order to make them fit with the international scheme proposed by the Institute, is comparatively small. There are other countries besides, which have been necessarily neglected in this study, where statistics are limited to showing the total number of cattle, without any or only with very summary specifications as to age, sex and destination. Their number is quite considerable, but generally speaking, the importance of cattle raising in these countries is comparatively limited.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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PROBLEMS REGARDING THE WORK OUTPUT OF THE HUMAN MOTOR

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The question of improvement in work output is the order of the day in many countries. The study of the influence of nutrition on muscle power is being continued uninterruptedly, as a good work output of an organism depends not only on a special morphological constitution but also on multiple biochemic phenomena of an eminently complex nature. The modern physiology of work, if it cannot always indicate with the desired exactitude that which should be done in all cases of food restriction, is, nevertheless, capable of giving information on that which is harmful and which should be avoided. In this vast domain every contemporary effort is summed up in the study of man, *in this sense that it comprises the thorough study not only of the physical properties but also of the psychic properties of the individual.*

The progress attained in the field of human biotypology and hygienic working conditions shows that it is possible to increase work output, to safeguard the health of the individual and to preserve the mass from the dangers which menace it. *The solution of the problem of improvement in working conditions and increase in work output are of fundamental interest, the international importance of which is evident.*

Introduction

The problem of the fullest utilization of human energy has for some time interested not only the world of science and industry but also that of agriculture. For some time there was the idea of introducing into industry the laws of pure science and still further, scientific methods themselves.

For mechanics to be applied to man, 'primary motor', it was necessary to constitute machines in science. This was the work of Galileo (1564-1642)

who succeeded in establishing the principles of simple machines and the resistance of matter; he applied these to animated beings. Struck by the phenomenon of fatigue, he thought at first to find the explanation in the fact that heavy bodies have a tendency to move downwards and not at all upwards; later he changed his opinion: the muscles tire because they have not only to displace the weight of the skeleton and that of the whole body sometimes: this applies to the legs. The heart, on the contrary, is indefatigable as it only moves its own mass.

At the end of the XVIIIth century, illustrious physicians and geometricians: Sauveur, de la Hire, Vauban, Amontons, developed their views on the human mechanism.

Vauban (1633-1707) formulated veritable regulations for organizing work, advocating that a workman should be employed only by piece-work, but on the condition that he is *well nourished.*

In the XVIIIth century, chiefly as a result of hydraulic research, study was made of the effort or, as was then said, of the quantity ' of action ', supplied by muscular activity. In 1785, Coulomb estimated the effort expended in different professions selected, including those in which man attains a degree of fatigue which it would be dangerous to exceed. The importance of speed of work on daily production was also noted.

Towards the end of the XVIIIth century and the beginning of the XIXth, popular methods for improvement in physical effort made their appearance. Their originators endeavoured to justify the influence of the natural and medical sciences on physical improvement and work output of workers. The studies of Ling and later (second half of the XIXth century) of Marey and Mosso, threw some light on the mechanism of muscular work and on the phenomena of fatigue.

The greater part of the scientific researches accomplished up to date by physiologists have chiefly aimed at establishing a relationship between the mechanical work produced and the energy expended, so as to verify the important principle of conservation of energy.

In the XIXth century, the pure mechanicians lost ground; today research is based more on biological phenomena, infinitely complex, than on physical phenomena. The progress made in social hygienics has gradually directed medicine from the individual to the mass. Today the question of good work output is recognized everywhere as being of world importance; but, at the same time, many countries must, owing to present circumstances, impose restrictions as regards food. The problem in question becomes, on this account, more difficult and more complex. If food is insufficient, the organism consumes first its reserve stock and diminishes its work output. Then once the equilibrium is upset; a whole series of more or less serious complications occur. Is there a fixed minimum of nutrition below which health and work output are soon endangered? Can one live and work for a long time on reduced rations? These are the most pressing questions to be attacked and which necessitate for their solution a knowledge of the most suitable methods and cautious action.

I. — Human motor, work and fatigue

The human motor

It is known that the organism differs from a machine in that it possesses a remarkable power of auto-regulation. If the organism disposes of food beyond its immediate requirements, it can place this excess in reserve in the form of glycogen in the liver and chiefly in the form of fat under the skin and about the viscera. The organism fattens, increases in weight, the surface area is enlarged. In consequence, its expenditure increases as the mass to be moved and the surface area become greater.

Inversely, if the nourishment is inadequate, the organism consumes its reserves; it becomes thinner and lighter and its requirements are reduced.

Naturally, this is only true within certain limits. Normally it is necessary for the organism to dispose always of a certain amount of reserve energy in order to meet sudden variations in requirements; if this energy becomes insufficient, work capacity is reduced.

Physiological work totals all the profound reactions of life, whatever the state of the muscles, at rest or in activity. Account must be taken to the same extent of effective work, that is, external to the worker, and of internal work occasioned by the movement of his limbs, his heart and lungs. Normally and at rest, the vegetative organs of digestion, respiration and circulation are active; they constitute internal work and consume a certain amount of energy.

Muscular contraction, from the motor viewpoint, originates in nervous excitation; a cause and effect relation exists between the nervous impulse and the muscular impulse. Contraction is rapid, sudden, so that the excitation of the nerve appears as the priming of an explosion. Also, the muscle becomes heated and takes a temperature slightly higher to its normal degree and a quantity of heat greater than at a state of rest is eliminated. Thus, the muscle functions as an explosion engine.

Man, as well as homeothermic animals, regulates his temperature at every moment so that it remains appreciably constant. According to CHRISTENSEN, the temperature of the body increases proportionally to the expenditure in oxygen per minute: the maximum is attained after 15 minutes, but depends on the type of work. From numerous experiments effected it has been possible to determine (by calculating the oxygen) the number and utilization of calories during intense work (1,080 kilogrammetres per minute for 160 to 180 minutes).

The loss in temperature through radiation depends on the difference in temperature of the skin with surrounding objects. During work the temperature of the skin is low owing to evaporation and the afflux of the blood to the muscles.

The influence of the environing temperature, humidity and air movement is little in the case of light work; but as soon as the limits of effort approach, the organism becomes very sensitive to the action of the environment. The first sign of deficiency in thermo-regulation is evidenced by cramp pains which often occur after excessive transpiration.

The effective energy expenditure of man is that which corresponds to muscular activity; under certain conditions, however, the muscles remain contracted without effecting kinetic work; the force thus expended involves a consumption of energy.

The organism is always 'in condition' and in thermal equlibrium by its expenditure of the whole, relative to the external environment and the internal milieu; in brief by static expenditure.

Static expenditure is that of man at rest, doing no work during the 24 hours, it represents an average of 32.56 cal. per kg. of body weight, in an enviromment of 20° C.; the adult man, weighing 65 kg., expends statically $32.56 \times 65 = 2{,}120$ calories per day.

The sole consequence of static force—without displacement— is the production of heat, which raises the temperature of the contracted muscles. The position of the muscles (power) which receive the load, the number of muscles which intervene in one effort, and even their function, modify expenditure; the output in this case, consists in turning the expenditure to the number of kilograms of effort; the value of the unity of static effort will be the output.

Work

The dynamic expenditure is that necessitated by both static effort and work effected.

If we indicate dynamic expenditure as De, static expenditure as Se and work as W, we have the following equation (formula of CHAUVEAU):

$$\mathrm{De} = \mathrm{Se} + \mathrm{W}$$

CHAUVEAU studied the effects of speed and effort on energy expenditure. Speed is an extremely important factor of economy, as is also seen from the formula.

The worker working quicker will expend less. The load or effort acts absolutely inversely; it increases expenditure; it is not a factor of economy, this would be rather a cause of waste.

Output

The ratio of the mechanical energy produced to the energy expended forms the output; this is a gross value deduced from the ratio of effective energy to total energy (static and dynamic).

Human activity is more closely connected with muscular work than with the mechanical work of the implement. The output increases in proportion to the amount of work carried out in a certain time. Speed exercizes the same effect on output as in inanimate motors; it increases output. The variations in output also depend on other causes; with normal continuous work, though not excessively tiring, the muscular fibre becomes more irritable, and the nerve cells and fibre more excitable; these are the features of impulse. Physical activity tends to facilitate the adaptation of each part of the body to improved output.

The changes that the muscles undergo under the influence of work can be verified externally by the increase in volume; the consistency of the muscle also changes according to the type of effort; when it is caused by intense and repeated work, a considerable thickening occurs: the muscle is hard and its tonus is increased.

The functioning of the muscles is in relation with the quantity of matter supplied and the waste products eliminated. The quantity of blood passing, within a given time, in the muscle is decisive in this respect. It all comes back to the energy of the cardiac contraction, assisted in its action by the elasticity of the arterial system and the adptation of the capillary tubes and the veins to the mechanical conditions imposed by the effort.

Central motor

The mechanical output of the heart during rest and the possibilities of controlling its energy during work determine the quantity and quality of physical effort. The cardiovascular system is influenced by the nervous system, nutritional interchange, humoural reactions. The cardiac muscle plays the part of a central motor by emitting into the aorta, on each contraction, about 50 gm. of blood corresponding to 4 litres per minute. In the case of considerable effort, the left and right parts of the heart can each emit 30 litres of blood per minute. The output of the heart, in adapting itself to requirements, may thus increase in the proportion of 1 to 7. The heart reacts to effort by rise in pressure and number of contractions and not by acceleration of the blood stream. During effort, the utilization of oxygen passes from 0.5 to 10 per cent. of its volume; maximum effort necessitates 15 per cent.

From the practical viewpoint, it is of importance to know that the cardiac output may vary within wide limits (from 1 to 7). Greater during effort, it particularly increases during digestion.

With long and considerable effort the pulse may attain 250 pulsations and even more. The critical limit stands at about 100. The intensity of work plays a less important part than its duration. The extent of average blood pressure is of considerable practical importance; it is a veritable physiological constant. A pressure of 120 should be considered as an indication of a defect in the circulatory system.

Blood pressure on its own, however, no longer serves as an adequate means of estimating the value of the cardiac muscle: it depends on many factors and different supplementary methods have been applied to complete it.

The immediate effects produced by physical effort on the circulation are numerous and complex.

Respiratory apparatus

The working of the respiratory apparatus is effected by multiple factors: composition of the blood, alkaline reserve, blood pH, development of the thoracic cage, the thoracic muscles, the diaphragm, blood circulation and lymph in the bulbar centre.

All these elements intervene in the action of respiration the maximum duration of which, in a normal man, is from 35 to 44 seconds, and in a woman, 22 to 44 seconds.

The term 'vital capacity' is used with reference to the quantity of air introduced and rejected by the lungs through inspiration and forced expiration. With a normal man this averages 3-4 litres; with a woman, 2-3 litres; its value is the best expression of the development of the thoracic cage, as it gives the total volume of pulmonary air without the residual air. With a considerable vital capacity, it is possible to dispose, during physical effort, of a greater reserve. When physical effort produces a dilatation of the lungs to such an extent that they do not rapidly recover their normal volume, the vital capacity decreases. Physical exertion increases the vital capacity in various degrees. The mensuration of the vital capacity may be very useful in the study of fatigue.

Muscular fatigue

It is very difficult to give a definition of fatigue. In most cases it is a question of a subjective sensation, more or less well defined (muscular pains, weakness, etc.), which leads to the stoppage of work and effort.

All muscular action is accompanied by various physiological effects which modify the intensity of respiratory, circulatory and nervous phenomena. These phenomena often attain a degree which is marked by fatigue. This is the normal case. In an extreme degree, it is over-fatigue, veritable pathological state.

Extreme fatigue, of an extent to cause cessation of work, is rare in modern agriculture where the heaviest work is carried out with machinery. At the present time, this phenomenon, on the other hand, is much more frequent in sport activities.

Fatigue necessitates rest; it is the determinant circumstance; it advances at the same rate as work to become, at a given moment, a cause of stoppage or inhibition; it is, from this point of view, a health protective function.

The lesser degrees of fatigue are such that the organism recovers its equilibrium and completely retrieves itself by resting after the period of work, and in particular by the period of quiet and sleep during the night. The consequence of fatigue is a diminished aptitude for work. There exists a veritable parallelism of the muscular and cerebral functions.

Two phenomena, one physical, the other chemical, appear to be the determinant causes of fatigue.

It has been admitted that, contrary to the muscles, the nerves are indefatigable. This point of view is too absolute; nevertheless the nerves tire to a much lesser extent than the cells and it has been proved that fatigue in whatever organ it is localized, corresponds to the formation of toxic substances in the organism. Moreover, these toxic substances increase as the albuminoid reserves are called upon when respiration is inconvenienced, as is the case with a fatigued man. Under these conditions the quantity of poison in the muscles, the blood, the kidneys, increases appreciably.

The blood circulates faster during work and carries these poisons to the suprarenal capsules which secrete adrenalin by which they are neutralized; the adrenalin oxydizes these poisons by means of the oxygen it contains. Rest, therefore, is necessary for this function of depuration to be accomplished; it allows, moreover, the elimination of the carbon dioxide accumulated in the blood, in consequence of intra-organic combustion.

The phenomena of fatigue observed vary according to degree of effort: heavy work, maximum work possible. If it is a question of static work, the appearance of fatigue is soon observed. With dynamic work, muscular fatigue is caused by the accumulation in the blood of waste products, by a shortage of oxygen, or by other changes in the blood and the exhaustion of different systems.

In work which requires dexterity, fatigue is evidenced by a diminution in coordination of movement and a want of precision in execution. The more complicated the coordination, the more rapid the appearance of fatigue. This is attributed to the central nerve phenomena, the peripheral nerves being practically infatigable.

A sort of dulled sensibility predisposes men of certain professions not to feel the more or less painful effects they produce. If, therefore, it is desired to ascertain the resistance to fatigue of a person, the amount of work or energy expended each day must be calculated. This would be occupational endurance, that is to say, profitable. The dynamic concept of endurance, however, does not relate to the state of extreme fatigue or overwork which exceeds the physiological limits.

Nervous fatigue

Intellectual activity often leads to a more marked fatigue than that of the muscles. It does not correspond to a measurable energy expenditure, especially as the repose of the muscles must mask it.

Nervous fatigue makes work more difficult, sometimes painful. The excitability of the nerve centres is then lessened: they present an increasing inertia. Whatever its nature, nervous fatigue is real and is manifested in proportion to the degree of attention which is required from man.

It may be said that work is all the more difficult when it necessitates also the use of the intellectual faculties and all the more easy when it is more automatic. The intervention of the mind is not an economic factor for the human organism. Brain fatigue diminishes not only the tactile sensibility but also the general sensibility; reaction to excitation is slower, the personal equation increases and aptitude for work diminishes.

It is a good plan to vary work in order that the nerve centres in question need not be constantly called upon, as they function in an alternating manner. In the case of the labourer, different jobs will be given him, he will be given diversions so that these emotions of another centre may repose him from uniform activity. These advantages, together with the restoration of the physical forces, should be assured by a suitable period of rest which at all times, has been found to be a sovereign physiological law.

Nervous equilibrium

All the adjustments of the 'human machine' are assured by the nerve centres. *The nervous equilibrium and muscular output are intimately bound up with the state of nutrition.*

Present conditions of work necessitate from the individual intense effort which considerably exceeds his psycho-physical reserves. The norms of a rational and economic activity cease to be observed. Fatigue becomes chronic and its effects accumulate; it ceases to be individual and becomes a collective phenomenon. The frequency of nervous disorders from hyper-excitability to serious forms of neurosis, is on the increase; the vegetative system reacts in its turn. Thus cardiac (sympathycotony, hypertension, tachnycardia) or digestive disorders start.

With the manual labourer, automatism, the simplification and the specialization of the different phases of physical effort render work monotonous, a factor which causes physical fatigue, so frequent in the workman. Interest and pleasure in work gradually disappear and progressively lead to the typical attitude of the workman towards a cut and dried task. In industry, the limits of technical effort allowed are often exceeded especially in the case of the system of bonuses. The rules are upset in the case of exceptional output of certain individuals who cannot be compared with the mass and it is forgotten that the limits of human effort are determined, as regards health preservation, by the structural and functional constitution.

Attention has been given for some considerable time to *rural neurasthenia*; Clainquert recognizes the frequency of this affection in farmers. We will limit ourselves to mentioning here that if neurasthenia shows special features in country people, this is due chiefhy to the still primitive physiology of the latter under many aspects, which means that these features have, for the greater part, the character of regressive phenomena. The more backward a peasant, the slower he is to move, if he is neurasthenic this tendency, having become morbid, results in loss of will-power. The more primitive a peasant is, the more timorous he is: this intermittant fear becomes, on localizing itself, to a certain extent a very selfish personal fear (fear of responsibility) as, the more primitive a man is, the more egoistic and less sociable he is. Rural neurosis reacts in different ways to this fear. Finally, automatism becomes, in all its forms, preponderant in rural neurosis.

Neurasthenia is due to affections which indicate most clearly the immediate relations of the physique with the morale. An individual affected by this type of neurosis acts as a physically depressed person whose brain quickly tires, whose memory is weakened, will-power diminished and emotivity increased. The 'mental state' of neurasthenic individuals is chiefly that of discouragement, with a tendency to physical and intellectual laziness. The question may be raised as to whether a sort of collective neurosis, brought about by special economic and psychic causes, may not soon strike an entire population if the necessary preventive measures are not taken.

Men and women are, in effect, practically equally affected. The proportion seems, however, to be slightly higher for men.

What in these last few years are the causes of the tremendous diffusion in in the country of a neurosis which up to the present was generally considered as urban ?

Can economic adversity, as has already been mentioned, predispose to neurasthenia and even condition it through the permanent discontent which it causes? The ascertaining of the deplorable result of unremitting work very often destroys the will-power of the peasant if he never has the inverse sensation of endeavour rewarded.

These causes evidently are not in any way peculiar to the country; certain others, however, are quite special, in particular, alimentary deficiency. This cause appears to us to be of the highest importance. Defective alimentation, especially in poor families is actually very widespread. In general it is impossible to consider the feeding of farm workers as being adequate. It cannot be denied that the protein intake is low. It is in fact, a more or less vegetarian diet, in which milk foods in all forms are wanting and in which the absorption of all condiments would be exaggerated. The proportion of fruits would also be reduced.

There is a tendency which—in times of economic adversity—leads to immediate economizing in food. In more than two thirds of neurasthenia cases a deficiency in ordinary food intake has been noted.

Hypo-alimentation appears to have the value of a veritable efficient cause in a certain number of them, combined or otherwise with other adjuvant causes of equal or lesser importance (these are the pathological causes properly so called, toxic or infectious).

Over-fatigue has also a preponderant importance in the etiology of neurasthenia; over-fatigue in the adult in the country is only transient but can, at the time, be extreme. It occurs specifically in summer at the time when the peasant is poorly nourished alternating the usual diet, frequently very deficient, with excessive physical effort, as for instance in the harvesting and threshing season.

Neurasthenia is extremely frequent in the countries and regions which do not present any ethnical or pathological peculiarities but always have as a predisposing cause exaggeration in human inadaptation.

In regions which have passed very rapidly from prosperity to economic decadence, neurasthenia is also very frequent.

The treatment of neurasthenia in the peasant presents certain peculiar exigencies regarding the environment and material conditions under which he lives. This treatment is often, owing to the conditions themselves, exceedingly difficult to apply and the results are frequently far from encouraging.

The treatment of rural neurasthenia should primarily be prophylactic, but it would be necessary, for this prophylaxy to be efficacious, for the alimentary and hygienic state of the country to be profoundly altered.

II. — Alimentation and work

Alimentation and energy expenditure

For any motor to function it must be given fuel. In the ' living motor ', the fuel is constituted by food and nutrition is the phenomenon of combustion.

The intra-organic combustion is identical in nature to all other forms of combustion: these are oxidations. However, organic combustion is slow, it takes place in all living beings, at practically all temperatures and in the case of man at about 37° C. This phenomenon of a slow reaction is explained by the presence in the living tissues of oxidizing agents.

Vital combustion is intracellular and although the muscular motors are the active seat, it is general throughout the organism. Energy is expended even in the state of complete repose, as consequence of life; alimentation is, in living beings, a general matter and, also, in the case of man, a special matter in that it serves as the source of effort.

Although the exothermic character of the whole reactions of the organism is indisputable, a fundamental feature distinguishes living beings from all other centres of heat. In the latter case it does not matter what the supply is, provided that it is combustible. On the other hand, for the former the only aliment is that which the cells have been able to assimilate, elaborated in a certain way. It is not that which is eaten at the time which supplies the energy employed in the physiological work of the organism, but the potential fabricated from that which was eaten previously. Distinction should be made on the one hand of the preliminary elaboration of the aliment without which there is no true nutrition and no energy and its subsequent utilization.

The fuel is placed in a state of reserve by the organism and thus can be subjected to slow oxidation to form the source of all energy. If the formation of a reserve is not possible, the substance is rejected, it is not an aliment. In the same way that our tissues constitute, to a large extent, an alimentary reserve, food represents a necessary contribution which compensates loss and increases the disposabilities.

Food ration

The food ration is generally mixed; the reserves of the organism which are the source of energy and its expenditure, are a mixture of fats, protein substances and carbohydrates. Each of these substances could not indifferently serve as an exclusive source of energy, as the animated motor necessitates a minimum of protein substances which in case of shortage it would take from its own substance.

Man has need, in his ration, of a certain number of calories which are supplied essentially by carbohydrates or glucides, soluble or insoluble, and by the fats or lipoids (animal or vegetal) as well as by a certain amount of proteinic matter, salts, vitamins, etc., which he will only obtain if his diet is both adequate and varied.

By suitably increasing or diminishing the quantity of food which a subject at rest absorbs in twenty-four hours, the ration which assures his equilibrium in weight is attained; in its mass, the body neither loses nor gains; in this case, it is a maintenance ration.

If alimentation is superabundant a reserve stock will be formed and the subject will gain in weight. If on the contrary, it is inadequate, the early reserves will make up for the shortage. In any way, the expenditure of the organism has a more or less constant level; its value does not change according to the alimentary flux. The maintenance ration is not the same for all subjects; it depends on the total mass of the body which varies according to age and sex; it particularly depends on external environment and state of activity.

Methods of calculating energy value

The methods employed for calculating the energy value of food are multiple. The numerous dietary studies carried out in different countries at various periods are based both on food such as it is purchased and on food ingested or assimilated. Some investigators have utilized the factors of RUBNER, others the factors of ATWATER or even the bomb calorimeter.

The factors of RUBNER and ATWATER are practically universally employed for calculating the energy value of the proteins, fats and carbohydrates of a ration. The factors of RUBNER are: 4.1 calories for 1 gm. of protein, 9.3 calories for 1 gm. of fat and 4.4 calories for 1 gm. of carbohydrate. The RUBNER value for proteins takes into account the loss due to waste.

ATWATER proposed two series of factors: one based on the aliments assimulated, which implies the analysis of wastage; the losses in proteins, fats and carbohydrates are then deducted from the food ingested.

The other series takes account of the nutriment ingested, the analysis of the wastage therefore, does not occur. With this series is obtained respectively for the first: 4.0 calories per gm. of protein; 8.9 or 9 calories per gm. of fat and 4.0 calories per gm. of carbohydrate; for the second: 4.4, 9.4 and 4.15 calories.

Other factors, not so universal, however, have been adopted by investigators. Fairly recently, the bomb calorimeter was used for determining the energy value of diets: it gives the values of the heat of combustion; the factor of 4.825 calories per litre of oxygen is employed in determining the energy value of mixtures of foods. The RUBNER and ATWATER factors, however, are used the most.

RUBNER established his factors in the following way: he wished to ascertain the number of calories that the organism succeeded in obtaining from the combustion of 1 gm. of protein, 1 gm. of fat and 1 gm. of carbohydrate. To obtain the factor for fats, he calculated the heat of combustion of olive oil, animal fat and butter. He found 9.31 calories per gram. For carbohydrates, he found 4.12 calories utilizing the heat of combustion of starch. In the case of proteins, however, the problem was more complex, as these are not completely oxidized in the body as they would be in the calorimeter. The heat of combustion of the products of deterioration not utilized, therefore, would have to be deducted from the heat of combustion of the proteins ingested. For these factors, RUBNER

calculated the heat of combustion of 1 gm. of the substance ingested in the calorimeter and the heat of combustion of the substances excreted in the waste products. These data enabled him to obtain a figure for the energy value of animal proteins. He then endeavoured to obtain a figure for vegetal proteins. By utilizing these values and knowing the proportion of vegetal proteins and animal proteins in a normal ration, he was able to calculate the average energy value of one gram of protein contained in a mixture of nitrogenized aliments, that is 4.13 calories. With these coefficients it is possible to calculate the *gross calories* (of RUBNER) in the diet, these elements of calculation being applied to the *edible part* of the ration.

ATWATER made known his '*net calories*' or '*effective calories*', that is to say, the number of calories utilized by the organism after the ingestion of a gram of protein, a gram of fat and a gram of carbohydrate such as they are found distributed normally in an ordinary diet. ATWATER determined the 'coefficient of utilization', which implies the analysis of the nutriment ingested and the corresponding waste products, for proteins, fats and carbohydrates. The quantity of each category of aliments found in the wastage has to be deducted from that nutriment ingested and the remainder is divided by the quantity of nutriment. The resultant figure is the coefficient of utilization.

ATWATER recorded the results of experiments carried out on man given different diets and he has collected the results of calorimetric studies on the heat of combustion of proteins, fats and carbohydrates. Knowing the proportion of these aliments in the rations, he calculated an average value of heat of combustion per gram of protein, fat and carbohydrate in a mixture of foods.

The calculations of RUBNER and ATWATER made under comparable conditions, agree very well. Here are some figures: Fat: 9.3 calories (RUBNER) and 9.4 calories (ATWATER); protein in a mixed ration: 4.0 (ATWATER) and 4.1 (RUBNER). The figures differ somewhat in the case of cereals or bread protein: 3.96 (RUBNER) and 3.68 (ATWATER).

In practice, according to RUBNER, the calculations based on these values were often corrected when it was desired to ascertain the *net calories* or *effective calories* of a ration. In this case, the value of combustion of all the waste products which were estimated at 8 per cent. of the calorific value of a mixed diet was subtracted from the energy value of the ration.

It is also necessary in practice to know if the calculations are based on the food such as it is bought. In this case, a certain percentage has to be deducted to account for *kitchen waste.*

Attention must be taken of the different significations given in different countries to the terms '*gross calories*' and '*net calories*'. From the practical standpoint, when the energy value of a ration is found, first of all, the elements of calculation which have been employed must be looked for: ascertain the nature of the factors and corrections used, know it they take into account the losses through waste; finally, if the calculations are based on food such as it is bought or on ingested food. If the coefficients are applied to foods such as they are purchased, a further correction has to be applied, to account for edible kitchen waste. In this case, it is necessary to deduct from the total figure, obtained by

means of the ATWATER coefficients, at least 1.5 to 2 per cent. as minimum of the edible kitchen waste in poor households.

BIGWOOD and KOOST (1939) estimate that the correction should be on an average 5 per cent. when there is no waste, but this factor may be much too high in certain cases and often even becomes very exaggerated.

The estimation of the average difference in calories there are between a gross ration and a net ration has not an absolute value, it depends on the system followed in defining these two magnitudes; only the difference based on strictly physiological definitions has an absolute value.

The problem of calculating the value of a diet is difficult. With a view to facilititing its calculation in different rations, veritable encyclopedias giving the proximate composition of foods have been published.

Alimentary deficiency

An insufficiency in quantity of food, the state of fasting itself, do not reduce the expenditure of the twenty-four hours to any appreciable extent: 5 to 6 per cent. the first day, according to the measurements of ATWATER; then the value tends to be constant. In brief, the organism manifests a certain independence with regard to external contribution of food, if the latter is reduced or suppressed for a short time. This is not the same case when starvation is prolonged. In this instance the respiratory exchange and nutritive metabolism progressively become lower.

In the case of undernourishment, it has been found that the strength progressively diminishes. In the state of starvation, the muscles suffer and lose their power. The intellectual faculties resist, as the nerve substance is less tried.

An individual in a state of inanition regains his weight quicker by absorbing ternary substances than with proteinic substances, provided that the latter are in the proportion of 2 grams per kilogram of weight.

Insufficient food has a greater effect on children than on adults, owing to the force of their calorific waste; undernourishment causes not only disturbances in growth, but also has consequences on the intelligence of the children.

It is well known that workers, farmers, soldiers, insufficiently fed, only furnish a mediocre work output.

Metabolism

To the whole series of transformations which mark the evolution of the aliment in the organism, the name metabolism is given.

The metabolism of repose or basal metabolism is defined by the quantity of oxygen necessary for the combustion of fats, carbohydrates and proteins. In a man weighing 70 kg., it is equal to 1 calorie per hour and per kg. body weight. The daily variations dependent on season, food diet, work, etc. as a rule do not exceed 15 per cent.

According to HERBST, the average values expressing the participation of the different organs in the ensemble of exchanges (basal metabolism) are:

Musculature	25 to 50	per cent.
Respiration	5	»
Heart	4.4	»
Liver	10	»
Stomach and intestines	7.4	»
Pancreas	4.8	»
Kidneys	6.5	»
Brain	3	»

Intense effort brings about a considerable increase in basal metabolism. With trained workers, the basal metabolism no longer increases.

The real consequence that exercise of the muscles finds in the organism has an absolutely general character, it is that which is called physiological effort (physiological energy, the total expenditure of the living organism, that which all the intimate reactions of its constitutive cells effect in a permanent manner).

If the effort increases the intensity of the cellular reactions, a greater acidity of the muscles is subsequently found; this is attributed to the formation of lactic acid.

The functioning of a muscle depends in the first place on the presence of substances, the disintegration of which furnishes the necessary energy, that is, the carbohydrates (ARDERHALDEN HILL, MEYERDORF, EMBIEN, etc.). The molecule of glycogen is hydrolized into two molecules of glucose, which under the influence of ferments, combines with the phosphoric acid and gives laticidogen. The molecule of the latter, in decomposing, sets free the necessary energy on contraction: lactic acid and phosphoric acid are formed at the same time. After contraction, the oxygen in the blood decomposes the lactic acid, forming carbon dioxide and water thus liberating the caloric energy. Part of the lactic acid is transformed into glucose and this, in combination with the phosphoric acid, into lactocidogen. By this inverse process, part of the waste matter is transformed into energy material. *This synthesis is already produced in the course of effort, if of long duration.* These reactions liberate a certain amount of heat and produce electric currents.

According to HILL, part of the lactic acid produced in the muscle passes into the blood. Prolonged effort, consequently, causes the appearance in the blood stream of an organic acid which diminishes the alkaline reserve of the plasma. General acidosis follows on local acidosis. HILL has designated under the name of 'oxygen debt' the quantity of oxygen required during repose to bring about the disappearance, after effort, of the acidosis produced by the lactic acid.

According to MARGARIS, EDWARDS and DILL, lactic acid only appears in the blood during intense effort corresponding to at least two thirds of the maximum exchanges. It has also been proved (ARPEM, SIMONSON, etc.) that the lactic acid is chiefly destroyed in the lungs.

In proportion to the increase in intensity of effort, the quantity of oxygen necessary to the organism augments to a considerable extent as also the quantity of CO_2 eliminated. The origin of carbon dioxide in the blood is twofold: on the one hand, it appears as product of the reaction which is effected in the muscles and, on the other, as acid displaced from its chemical combinations by a stronger acid (lactic acid).

Effort increases the elimination of water through the skin and the lungs and, in particular, transpiration. The result is an impoverishment of the blood in water and an irresistible need to bring it back to the normal level: this is thirst. The density of the blood rises slightly.

Metabolism during rest or effort bears on the nitrogenized substances to an appreciably constant extent: 60 to 65 grams per day. It affects the carbohydrates as source of free energy transformable into mechanical effort. At the same time, it regulates the temperature of the body round about 37° C. as it is a necessity. This expenditure of regulation appears to be a charge of fats, in preference to all other foods.

The activity of the muscles increases the intensity of the humoral circulation (blood and lymph), causes a rapidity of combustion which may raise the general temperature by about 1° C. and stimulate appreciably the digestive functions.

Calorie requirements of man

In the scale proposed by the technical Nutrition Committee of the Health Organization of the League of Nations, the unit corresponds to the ration of a man (adult of average size, leading a sedentary life), this is a ration of 2,400 net calories. Under these conditions, the coefficient of an adult man at work is superior to the unit and this basic scale can easily be adjusted according to the circumstances that arise.

There was not complete agreement on the fact that a ration of 2,400 calories sufficed in the long run for a man of average size expending little energy. According to the investigations of LENOIR and RICHET, the number of total calories per 24 hours should vary, according to conditions, from, 2,000 to 4,000 calories. Here we are only dealing with the average adult, from 24 to 30 years, effecting average work and living in a temperate climate, weighing 67 kg. and measuring 1.67 metres in height.

In the U. S. S. R., the average figure (gross), given following an official investigation, is 3,800 in the country, and 3,644 in the towns. Other investigators consider that these figures are too high. LABBE gives a figure of 2,350 to 2,800 for a man weighing 67 kg. and carrying out average work.

Some physiologists think that a certain rhythm in expenditure is optimum for the health, as that which corresponds to 2,400 calories is below this optimum rhythm and is not compatible in the long run with a state of normal health even if the requirements of mechanical effort reduced to a minimum are provisionally covered by the contribution of 2,400 net calories.

Allowing that the optimum rhythm of expenditure of an adult man of average size, weighing from 65 to 70 kg., is practically always about 3,000

net calories per day, in the case of the majority of occupations followed in countries with temperate climates, the scale in which the unit corresponds to *3,000 net calories* could, however, be utilized and its *use is unquestionably more practical.*

The Conference of Experts of the League of Nations conceded (1937) the figure of *3,000 gross calories,* while recognizing that the 'majority of its members consider this figure too high' and that '*the figure of 2,700 to 2,800 calories, for the average man would be closer to reality*'.

We adopt this figure of 3,000 gross calories knowing that is applied to adults in good health, average workers, but that it allows of a margin of safety a nd that many physiologists consider it as being a little high; 2,800 gross calories would be sufficient.

The calorie requirements of the human organism vary according to multiple conditions and, for example, according to sex. The experts of the League of Nations allow that if the ration of man is 1, that of woman should be 0.8. The Russian experts considered that, with equal work effort, the ration should be identical. As regards age, LENOIR and RICHET proposed (at the 2nd international scientific Congress on nutrition, 1937) applying the following coefficients: from 22 to 25 years, 1.05; at 35 years, 0.95; at 40 years, 0.90; at 50 years, 0.85.

If is evident that if the temperature falls, the calorific expenditure increases; because of civilization (heated houses, comfortable clothing, etc.), changes in our food requirements owing to the different seasons are much less that under natural conditions. When one bases oneself on the surface and weight of an individual, one insists on the fact that the weight considered should not be the actual weight but the ideal weight, that is, the weight of a subject of the same size and of normal corpulence.

Food and functional capacity

In the study of foods, it is important to specify their role according to the nature. It is important to know which aliment, fat, protein, carbohydrate, will be utilized by the organism, in dynamic activity. There is a chemical and physical question in the choice of ration.

It has long been known that the protein and carbohydrate minima, accompanied an adequate vitamin supply, assure good maintenance and normal functioning of the organism; we would like to give some outline of the different means of increasing the physical possibilities of the individual.

Each principle, each substance or mixture of substances have coefficients of digestibility or better, coefficients of nutritive utilization. Thereby the ration between the quantity actually utilized through cellular work and total quantity ingested is indicated. The coefficiency of digestibility of carbohydrates (cellulose, starch, dextrin), sugars, glycogen, etc.—they are abundant in starchy and mealy substances—varies between 0.90 and 1; that of fats (oils, butter, etc.) is from 0.90 to 0.97; that of protein substances from 0.68 to 0.98, according to the aliment. It is low in vegetable foods; its average value is 0.91.

The role of carbohydrates is to contribute the necessary energy for the upkeep of the functional activity of the organs. These substances are essen-

tially sources of energy. Given in excess, they form a reserve after their transformation into fat.

A minimum of glucides would be indispensable for the maintenance of functional activity. The blood glucose is the food contributor of energy for the upkeep of the activity of the muscles and, in a general way, of all the organs. On the other hand, it seems that, for want of glucose or glycogen, the muscles, may utilize the fats to a certain extent for the maintenance of their activity but this certainly is only an accessory role.

By furnishing carbohydrates in an easily assimilable form during work, the moment when fatigue starts can be deferred.

Under conditions as identical as possible, expenditure is less with carbohydrates than with fats, that is, the sugar ration is more economic than the fat ration.

To be able to carry out difficult work of long duration, the diet which precedes this effort should supply considerable energy in the form of carbohydrates.

Lately, however, this point of view has been modified considerably. From the numerous experiments carried out, practical conclusions have been drawn, *viz.*: trained subjects effect light or moderate work by utilizing the carbohydrates and fats in the proportions determined by the precedent food diet and practically identical to those at the state of rest. A heavier labour involves the increasing combustion of carbohydrates and not of fats. The relative requirements in oxygen are reduced by 15 per cent., this diminishes the fatigue imposed on the heart.

The carbohydrate diet is more economic than the nitrogenized diet; the materials of the former are more rapidly utilized than those of the latter.

Carbohydrates may be considered as constituting the most suitable combustible for muscular effort, and it has long been thought that efficacy can be improved by the absorption of easily assimilated carbohydrates, immediately before or else during muscular work. This conception must have appeared all the more natural in that numerous experiments proved that a drop in the glycogen rate, due to the impoverishment of the carbohydrate reserves of the organism, may give rise to a state of exhaustion.

In prolonged muscular effort, the absorption of glucose increases the functional capacity. As an example, mention may be made of some experiments in which individuals were made to work with the KROGH ergometer up to complete exhaustion; in the presence of a low glucose content of the blood, exhaustion may be overcome without interrupting the test, by the absorption of glucose or cane sugar and, under good conditions, work can be continued for another hour.

For increasing the functional capacity, the use of cane sugar is advocated as this sugar is cheaper than glucose and gives just as good results.

Nutrition during heat

The alimentation of workers operating during heat must contain chiefly carbohydrate substances, as these do not encumber the stomach and have specific dynamic properties. Moreover, the fats and proteins of the food ration

should preferably be consumed in the evening; the best system is to eat frequently but not abundantly. It should not forgotten also that the organism must be supplied with a sufficient quantity of water. The sensation of thirst during heat reveals the necessity of the organism and prompts its satisfaction. The organism, in fact, cannot support a loss in water over 10 per cent. The regulation of the water content of the organism is very strictly controlled.

In the regulation of water interchange, the mineral substances play a very important part. Besides a determined quantity of liquid, the organism has to have a sufficient quantity of sodium chloride, as the metabolism of water and that of NaCl are closely associated; for this reason it is indispensable, the necessity of which is seen from the eagerness which a man working under very warm conditions testifies in this respect.

Consequently attention must be given to the quantity of mineral matter and especially sodium chloride; man derives the quantity of NaCl necessary for his requirements to a small extent from the salts contained in the food and to a greater extent from marine salt. The other chlorides: potassium, magnesium, etc. do not fill the same regulator role.

In all organisms there are considerable quantities of sodium in the form of chlorides, sulphates, phosphates and organic salts, sodium abounds in the liquids, and in the tissues potassium, which is the dominant mineral of the cells.

It is the merit of BUNGE of having established that the organism suffers from a shortage of NaCl; this is easily seen in a man who follows a vegetarian diet as also in herbivorous animals. The point is that vegetables contain more potassium than sodium and, consequently, in vegetarian diets, the former salt is the more abundant.

The question should be raised as to why an excess of potassium salts in man and also in animals raises their requirements in sodium salts. It appears that the salts of potassium have the power to replace the sodium salts in their combinations in the tissues, by a mass action or vice-versa. In effect, any excess in the contribution of potassium salts leads to a strong elimination (urinary) of sodium salts; and the phenomenon opposed by an excessive contribution of sodium salts can be observed. This is why *the vegetarian diet which is rich in potassium, leads up to the necessity of increasing the quantity of sodium salts in order to prevent an excessive loss of these salts.*

In physical work of long duration, a shortage of NaCl may lower the functional capacity. All the more so as, in general, the content of this salt in food is lowered so as to reduce thirst.

In the course of effort effected under very warm conditions, the loss in salts and especially in sodium chloride is such that a symptom is then apparent, which is designated as 'miners' cramp' or 'heat cramp'. In such a case, it is imperative to administer a supplementary dose of salt. *Even during physical effort of long duration, it would be possible therefore, to employ advantageously as 'stimulant' doses of sodium chloride.* According to RICHET, the toxic dose of NaCl is 3 gm. per kg.

The importance of substitute foods and their nutritive value

In present times it is necessary to mention the chief sources of food more or less neglected up to date.

For example, as substitutes, for meat and the usual proteins, the following products are advocated: casein, skim milk, white cheeses made from skim milk the blood of certain animals, plucks, groundnut and soybean flour and cake, lucern leaves.

Dried casein is entirely lacking in sapidity; on the other hand, however, it has a considerable food value.

Skim milk white cheese usually has a high water content and is insipid; its nutritive value is much lower than that of ordinary cheese as, if it is rich in proteins, it contains no fat.

Skim milk has a calorie value of approximately 300 to 400 calories per litre and is completely or almost entirely deprived of its fat-soluble vitamins.

The progress made in vitaminological science has shown that special attention should be given to *alimentation in vitamins*, as vitamin shortage is not expressed by a definite sensation of hunger.

The producing of new aliments and plants with the highest possible vitamin content, is still a recent idea and a very important task for modern agriculture.

Therefore, the fruits of certain plants which are rich in vitamin C should be utilized and no longer wasted, for example: *Rosa acicularis* (3186-6094 mg. % gm.); *R. dahurica* (1540-1580 mg. % g.); *R. cinnamomea* (1432-1563 mg. % g.); *R. canina* (1000-2164 mg. % g.); *R. rubiginosa* (3876 mg. % g.); *Actinidia kolomicta* (987-1085 mg. % g.) as well as many others.

It should not be forgotten that an appropriate conservation of fresh herbage and forage with the addition of acids (A. I. V. method) prevents the destruction of vitamins. With forage ensiled in this way, a milk rich in vitamins can be produced in winter.

The leaves of lucern (*Medicago sativa*) are rich in proteins (4 to 5 per cent.) and in vitamins A, B_1, B_2 and C, and are acceptable to man also provided any excessively hard stems are removed.

The meal of groundnut and soybean presscakes which are given to livestock may be utilized by man. Groundnut cake contains about 60 per cent. proteins and 15 to 20 per cent. assimilable glucides. Its occasional use is commendable, but it is advisable to await the results of a further prolonged testing before recommending large consumption of this product.

As substitutes for alimentary oils, use may be made of synthetic oils which are oils in which the glycerine has been replaced by another alcool, and there are also the oils (LESNE) obtained from walnuts, grape pips, beech nuts, hornbeam (*Carpinus betulus*) seeds, pumpkin and tomato seeds.

With the present technique it is possible to turn to account the bones and fibrous tissues, material which is richer than is generally thought in nutritive substances.

Today it is known how to extract the maximum fat and gelatine from this material, to dilute them subsequently and mix them with suitable food preparations: soups, pies, preserves, etc.

Sugar can be substituted by concentrated grape must, apple juice and malt extract.

According to CHONARD, the composition of the Gerusalem artichoke resembles that of the potato and the chestnut; this is twice as nourishing as the potato. He indicates that utilization could be made of certain parts of edible plants formerly discarded, *viz.*, the leaves of turnips and rape, nettles, wild mustard, the bulbs of the wild hyacinth or bluebell.

As substitutes for coffee there are malt, barley, chick peas, carobbeans. As regards yield in coffee substitute, the following may be mentioned: dried malt (75 per cent.), dried beet cossettes (70 per cent.), fresh fruit press residue (17 per cent.).

Chicory and endive roots, acorns, the debris of dried figs, unsaleable dates are the most indicated to prevent wastage in food products.

For many of these products it is not a question of a novelty properly so called, but a return to vogue and improvements for others, on the contrary, it will be a question of the production and application of completely new processes. The utilization of waste products and residues is not always guided by physiological criteria, but it is certain that this more rational and intensive utilization can be attained in an exceptional period of food scarcity.

III. — Means of improving physical capacity

The use of methods for increasing physical capacity is nothing new, and it was already known in the past that certain substances can bring about amazing force.

In theory, there are several ways of increasing output: notably, the organism can be given the elements utilized during muscular effort such as concentrated food products, salts, oxygen and vitamins. A similar result can be attained by treating the nervous system either with stimulants or sedatives (cocaine, caffeine, benzedrine, sedative substances, etc.).

There are some substances which accelerate circulation and which act on the vaso-motor, the heart and the vascular system. Other means may have a direct action on the muscular system. For all substances of this type, however, it would not be possible, *ipso facto*, to draw any conclusions as regards their action on the whole organism.

Attempts have frequently been made to increase the functional capacity of individuals subjected to arduous physical tests, by giving them *alkali in the form of sodium carbonate*, with the idea that in thus compensating the decrease in the alkaline reserves of the blood, consequence of an increased production of acid due to muscular effort, physical capacity is augmented. In the experiments carried out, it was found that, as a result of alkalosis, the organism, before attaining the exhaustion stage, can contract a higher oxygen debt and accomplish a much greater effort than normally. A series of subsequent and more important experiments, however, did not indicate any increase in functional capacity,

although the same modifications were seen in the composition of the blood. Before administering these substances, it should be remembered that during effort, the modifications which take place notably in the pH of the blood and in the tension of its CO_2 influence the respiratory regulation. The administration, *per os*, of alkaline substances constitutes such a brutal intervention into the regulator mechanism of the pH that it may well be more harmful than beneficial in its action on maximum functional capacity.

For airmen and workers who frequently have to work at high altitudes, it would be interesting to ascertain the beneficial effects of *ammonium chloride* in acclimatization to low oxygen pressure.

As regards the action of *phosphates*, there is a whole series of studies based on the investigations of EMBDEN and his collaborators and treating on the role of phosphates in muscular interchange. Practical experiments with soldiers who were made either to haul a braked ergometer or to carry out long marches have indicated a general increase in functional capacity of over 20 per cent. after taking phosphates.

The ingestion of phosphates is very important as they have an unquestionable action on physical and psychic activity and they attenuate the effects of muscular exhaustion.

The power of increasing phsyical output has also been attributed to *calcium*; RIESSER, on isolated muscles, found an increase in functional capacity.

Fats are an integral part of living matter; they assure the maintenance of body weight better than proteins, but carbohydrates surpass them.

Fats should be considered not only as contributors of energy and calories, but also as qualitative modifiers of nutrition, playing a role somewhat similar to that of vitamins which intervene in the utilization of aliments. Their utility, therefore, is of the first order and justifies the importance which is attributed to it, in the determination of rations, in the adipo-protein ratio.

The maintenance of a growing organic mass necessitates an equally increasing alimentary expenditure. Primarily, it is necessary to restore the worn tissues, inevitable consequence of life; this wear can only be repaired by means of nitrogenized matter. Every ration, therefore, should contain a *minimum of proteins;* about one gram of proteins per kilogram body weight. Proteins, when in excess in a ration, have been found susceptible of giving rise, in the animal organism, to fat and glycogen, but their chief role is to contribute the nitrogen required for synthesis, in order to assure growth in the young and repair functional wear in the adult. This synthesis is effected by regrouping on a new plan, the fragments (amino acids) of the proteins in the ration, deteriorated in the course of digestion.

The human organism requires a production of a gram of proteins per kilogram body weight and enough carbohydrates to suffice for muscular effort (external and internal); but for the regulation of temperature, the control of cold, the nature of the 'fuel' is indifferent.

According to NOTHNAGEL, proteins have a true specific motor power. Individuals subjected to food restriction have a reduced spontaneous motive activity. If their ration is increased, their activity augments but a minimum increase

in proteins is necessary for the variations in the ration to have effect on the motive activity.

An example of this is given by BUNN. In a factory in the United States 350 women worked at machines the output of which was shown by an indicator. The work was mediocre. They were given then, as a supplement, two large glasses of milk a day. Weight increased (on an average, 2 ½ kg. in 12 weeks but chiefly their work output increased, by 55 to 75 per cent.

Particularly invigorating qualities are attributed to preparations based on *lecithin*. The egg, for example, has always been taken as a fortifier for muscular work and other effort of a similar kind. The use of lecithin, however, with a view to increasing work output, is not based on any experimental foundation.

The same remark applies to certain dietetic specialities which, in fact, only represent calories sold at a high price.

There are substances which appear to act directly on living matter, on the muscular or nervous fibre, and which are accompanied by effects of little relation to their calorific energy. These are nervin foods; as some of these reduce energy expenditure, they are also called 'economy or dynamophore foods', notably the following: coffee, tea, maté, coca, kola, capsicum, common salt, common alcohol, etc.

Their action is complex: the greater part of them are toxic in very small doses and are manifested by the nerve troubles they determine.

Included under the name of 'dope' are certain special pharmaceutical products such as benzedrine, cocaine, caffeine, coramine and other substances. In a general way, the term 'dope' designates all substances which serve to improve *temporarily* physical capacity.

Cocaine is one of the most ancient products used in doping. FSCHUDI writes on the functional capacity of Indians under the influence of coca leaves: 'An Indian carried out extremely heavy work, but he was chewing coca leaves'.

In present times, workers employed in very heavy work under unfavourable conditions in South America, still consume large quantities of coca leaves. CHRISTENSEN relates that the miners in the mountains of Chile who do heavy work at an altitude of 5000 metres, consume large quantities to which they attribute considerable force in the acclimatization to low oxygen pressure and low temperatures. The use of this poison is officially prohibited, but this prohibition is not strictly applied as it would result in immediate abandonment of work.

Numerous investigations have been made on cocaine in relation to muscular effort. From these experiments it would appear that weak doses of cocaine (0.1 gm.) attenuates the sensation of fatigue. The functional capacity of the individuals tested was much higher with cocaine than without. On the other hand, strong doses of this substance caused fatigue and dislike for work.

It may be said that cocaine acts effectively on the sensation of fatigue and that, therefore, it unquestionably improves *functional capacity* in the course of effort of long duration. This method of suppressing the sensation of fatigue, however, is certainly not inoffensive, its toxicity is very considerable when employ-

ed in large doses and the desire for this drug is instilled with continued use and leads to cocainomania. Consequently, *the use of cocaine should be rigorously prohibited*.

It is known that *caffeine* and other derivatives of *purine* are very widely employed as stimulants in physical and intellectual effort. They are utilized either in the pure state or in the form of coffee, tea, kola and chocolate. Caffeine acts as a stimulant on the central nervous system; it has a favourable influence on the physical functions especially during intellectual fatigue.

Graf has carried out an extensive series of exhaustive experiments on the effects of *kolanut* on muscular effort and, in the first place, he studied up to what point its action would differ from that of caffeine. In his experiments he employed chocolate with and without caffeine, chocolate mixed with desiccated kolanut and a little coffee.

After the absorption of ordinary chocolate, chocolate containing caffeine and kola chocolate, output improved, the last mentioned product causing by far the greatest increase in functional capacity (from 20 to 30 per cent.), while the improvement obtained with chocolate having caffeine was not much higher than that due to ordinary chocolate.

It may be considered, therefore, that preparations containing kola are capable of improving functional capacity when it is a question of physical effort of long duration.

It is very difficult to know to what extent the use of pure caffeine or caffeine in the form of coffee, chocolate or kola given habitually as a stimulant, may be harmful to the health. It is probable, however, that a substance which stimulates the functional capacity of the organism so as to enable the limits of normal fatigue to be exceeded, carries some danger for the health.

Benzedrine (β-phenylisopropylamine) seems to be even more effective in masking the sensation of fatigue. Up to date, no investigations have been made on the possible action of this product on muscular effort.

Attempts have also been made to utilize *digitalis* taking into account the fortifying action it exerts on the heart. Numerous works have been published on the absorption of *coramine* and *cardiazol* which act as stimulants on the central nervous system.

As regards *alcohol*, its toxic action is so predominant that it is this and not its role as a source of energy which matters in this case. Everyone is aware that in high doses, alcohol diminishes physical capacity: these observations are confirmed by experimental research. Certainly it cannot be denied that, in small doses and taken at an opportune time, alcohol, by effectively attenuating the symptoms of inhibition and the sensation of fatigue, have certain stimulating properties.

It has been shown that all physical effort accomplished jointly with psychic activity, are unfavourably influenced by alcohol. Mention may be made of the interesting experiments of Atzler and Meyer on the action of large doses (240 cc. alcohol in the form of beer or brandy) on heavy muscular work carried out by an inebriate. The experiments indicate that work output – as also the general functional capacity – is very reduced when the alcohol is consumed the

day or evening before the test. If the alcohol is absorbed four hours before the test, the intensity of effort is not modified and the general functional capacity would be increased rather than lessened. Alcohol absorbed immediately before beginning the test would not have any very definite action on physical capacity. On the other hand, during the test, the intensity of effort is slightly higher and extremely irregular. Alcohol being toxic, its use with a view to increasing output in effort, therefore, is not commendable.

Ether is reported by SEEL and by other investigators as a stimulant but its use is not widespread. It is usually employed in the form of Hoffmann's drops, composed of one part ether and three parts alcohol. Its use would be of little importance as regards effort.

In regard to *vitamins* for the improvement of physiological capacity mention may be made of vitamin B which plays a part in the metabolism of the carbohydrates. Following the administration of brewer's yeast extract, LELESZ and RANDOIN found a considerable increase in glycogen in the liver as well as in the muscles and, basing themselves on the researches of EMBDEN and HAB, who, in the muscles of trained athletes, discovered a higher glycogen content, they consider that the absorption of a large quantity of yeast favours muscular effort.

Vitamin B appears to play some part in the prevention of fatigue. GONNELLE even called it *muscular vitamin.*

Vitamin C should be abundantly represented in the food of all workers, at the same time, however, it must not be expected that with an excess of this substance, that the functional capacity will be increased.

The *action of hormones* is very considerable. The influence of hormones on metabolism has long been known and it is known, for example, that adrenalin increases the utilization of the carbohydrates; well known is the action of the hormones of the lobes of the hypophysis (anterior lobe which intervenes in the metabolism of fats), the action of insulin as regards the metabolism of sugar, the action of the cortico-suprarenal hormone (synthetic) in association with vitamins B and C, which facilitate muscular restoration after fatigue and efficiency in work with an extension in its duration, etc.

In recent years, the use of *ultra-violet rays* has also been also been discussed. During irradiation, and effort of 1,836 kilogrammetres, for a duration of 2 minutes, was accomplished with a considerable improvement in output. Irradiation, therefore, influences the organism in the sense of causing an improvement in physical capacity. To establish definitely whether irradiation really enables more work to be accomplished, an individual worked at the ergometer up to exhaustion. After some time, an effort of 180,000 kilogrammetres was reported. The application of ultra-violet rays causes modifications in the organism which result in an improvement in functional capacity.

Much has been written on the action of *tobacco*, but it is useless to treat on the question here, as it is unanimously acknowledged that the use of tobacco brings about a decrease in output.

From the hygienic viewpoint, to increase physical output, any agent which may have some possible harmful action should be rigorously prohibited. The

responsible authorities should completely abolish the use of anything which may cause excitation or an indirect danger by stimulating the organism and inciting it to high output.

IV. **Professional work**

The specialization in work necessitates from man a physical or mental effort which often exceeds his forces.

The biological reactions of the living organism, after the effort to which it is compelled under present conditions of work, must be effectively known; the exhaustion of the reserves of energy transmitted by the preceding generations must be avoided, the overwork and degeneration of every individual excluded.

Without going into long scientific discussions, we would like to call attention to the progress realized in recent years by physiology and medical science in the hygiene of work. In this field, every contemporary work is summed up in a few words: *the study of man* in the sense that it is a question not only of the study of physical properties, but also of psychic properties.

Metabolism during work with the scythe.

	Surnames and Christian names (initials)			Average
	S. G.	M. U.	M. N.	
Ages	30	44	44	—
Height in centimetres	163	163	174	—
Weight in kilograms	58	58	75	—
Degree of training—Number of years	3	4	6	—
Metabolism: at rest standing—Calories per minute	1.29	1.70	1.66	—
First test:				
Calories per minute after subtraction of calories of metabolism in repose	6.81	5.40	6.74	—
Work effected—Number of cuts with scythe per minute	40	38	41	—
Condition of environment:				
Temperature—Degree C°	23	23	23	—
Humidity (percentage)	66	66	66	—
Vapour pressure	13.89	13.89	13.89	—
Wind velocity: metres per minute	—	—	—	—
Second test:				
Calories per minute after subtraction of the calories of metabolism in repose	5.33	5.81	4.37	—
Work effected—Number of cuts with scythe per minute	44	40	40	—
Condition of environment:				
Temperature—Degree C°	28.4	28.4	28.4	—
Humidity (percentage)	44	44	44	—
Vapour pressure	13.02	13.02	13.02	—
Wind velocity: metres per minute	132	132	132	—
Averages of the tests:				
Calories per minute of work	6.07	5.61	5.54	—
Calories per hour of work	364.20	336.60	332.40	344.4

The study of the *physique of man* raises the problem of the total functional value of the individual. This question, which regards as much the viewpoint of professional work as that of physical training and concerns both their effects on the organism and the conditions of improved output, is of evident pratical importance. In this field, research work has increased considerably.

The *scientific study of professional work* dates to scarcely half a century. Antiquity did not assign any law to labour outside that of slavery.

In the modern study of professional work, special mention should be made of F. TAYLOR and his followers. Their method is based essentially on the chronometry of movements in order to ascertain the optimum speed, and on the judicious selection of useful movements, necessary in work, which involves the suppression of all those movements which appear unnecessary. The duration of useful movements, determined on a picked workman, enable the ideal output to be estimated.

Metabolism during work with the sickle.

	Surnames and Christian names (initials)			Average
	S. G.	M. U.	M. N.	
Metabolism in repose standing	1.02	2.02	1.66	—
Work effected in Millet position:				
Calories per minute, after deduction of calories of metabolism in repose	2.35	3.44	4.15	3.31
Estimation of work effected: Cuts with sickle per minute	80	93	95	—
Work effected in curved position:				
Calories per minute, reduction made for the calories of metabolism in repose	3.64	4.76	3.31	3.90
Estimation of work effected: Sickle cuts per minute	76	98	99	—
Work effected kneeling:				
Calories per minute after deduction of the calories of metabolism in repose	2.79	3.96	2.79	3.18
Estimation of work effected: Sickle cuts per minute	79	96	99	—
Condition of environment:				
Temperature C°	28	21.8	23.8	—
Humidity (percentage)	51	75	72	—
Vapour pressure	14.19	14.63	15.74	—
Wind velocity (metres per second)	98	30	—	—
Barometric pressure	750	760	759	—
Averages of the tests:				
Calories per minute	29.2	4.05	3.41	—
Calories per hour of work	175.2	243.0	204.6	207.5

The study of professional work should take into consideration the equilibrium and movement of the human body, it should also determine the influence of good tools or implements. It is the first of these two questions which we will discuss almost exclusively.

Among the chief and most characteristic farm operations, those effected with the scythe and the sickle are of considerable interest. The energy expense of workers employing these tools, according to the interesting experiments carried out by Di Granati, is indicated in the tables given on pp. 25 and 26.

The preceding tables show that, according to the type of implement employed, energy expense varies considerably; an average of 344.4 calories with the scythe and 207.5 calories with the sickle. This difference is due to the technique required in working with these implements.

According to the same investigator, the metabolism during the 24 hours (work 8 hours, sleep 8 hours and activity outside work 8 hours) for the two types of implements is as follows:

	Work with the scythe Calories	Work with the sickle Calories
8 hours sleep	523.30	523.30
8 hours activity (outside work)	1,124.80	1,124.80
8 hours work	2,755.20	1,612.00
Total . . .	4,403.30	3,260.10

The energy expenditure during a day's work with the scythe, therefore is much higher and could be classed as *intense* work, while the use of the sickle requires less calories and may be considered as *average* work.

The scientific organization necessitates not only a good choice of implements but also the study of the different positions adopted so as to attain the best work output.

Metabolism in the different positions used in working.

Surnames and Christian names (initials)	Calories in standing position	Calories with Millet position	Calories in curved position	Calories in kneeling position	Variations in percentage of expenditure for 3 different positions (in comparison with the standing position)
S. G.	1.02	1.80	1.57	1.27	+ 76.4, + 53.9, + 24.5
M. U.	2.02	2.46	2.00	2.02	+ 21.8, — 1.0, + 1.0
M. N.	1.66	3.13	1.80	1.92	+ 88.6, + 8.4, + 15.7
Averages . . .	1.56	2.46	1.79	1.74	+ 62.27, + 21.1, + 13.7

It is evident that in the truly scientific organization of farm work, not only must the best implements and best working conditions be considered, but the worker must first be examined; the detailed study of man and the choice of a biological type (biotype) suitable for each type of work, is a primordial question.

The human body is an articulated system of which the different parts are not joined in an immovable manner forming a rigid whole; the body is never at rest; the movement of respiration and circulation alone continually disturb this repose and also, the vibratory state of the muscles, always more or less contracted, imparts to it a series of oscillations, or else the rupture of equilibrium of these oscillations.

The human body is a material system subjected to external forces, the chief of which is gravity and to the internal forces of the muscles. It is also a heterogeneous body, its form is not regular; finally, it is not isolated in space, but placed on the ground by a base, that of the feet. It is to such a system that the laws of general mechanics have —with good reason—been applied and numerous scientists have been able to establish the statics and dynamics of the human body.

The system of TAYLOR is inadequate from the physiological viewpoint and we lay stress on this point: today, we have the means of estimating the degree of fatigue, ascertaining the speed, rhythm, the effort which, for maximum work, necessitate the smallest energy expenditure. A disadvantage of the TAYLOR system, therefore, is the absence of physiological control and too intensive selection.

It is not the aim in modern agriculture to utilize more and more rapidly the strength of the peasant at the risk of damaging his health; on the contrary, the desire is to husband and improve this strength in durable interest.

Supplemented and supported by the psycho-physiological sciences, the system of organization of work will one day synthesize the most modern scientific acquisitions regarding the orgnization of agricultural work.

Classification of physical labour

Numerous studies have been made on this subject. In physical labour, several categories may be distinguished; for example, work requiring strength; work requiring speed; work of long duration; work requiring skill.

Work requiring strength demands the maximum output from the muscles; a considerable cardiac effort is necessary; the muscular contractions are slow, often it is a question of static work; the muscles become hypertrophied, turning short and thick.

Work requiring speed represents a very strong effort accomplished in a very short time: it represents, from the physiological viewpoint, the principal excitant agent of development and growth, but its generalization is impossible owing to the fact that this type of work leads to a hyperexcitability of the nervous system.

In *work of long duration*, the musculature is in action for a long period; the work produced in the unit of time not being considerable.

Work requiring skill which only demands a minimum expenditure of effort, serves primarily for the training of the faculties of coordination and is an excellent 'educative' means of the nervous sytem.

Distinction should also be made of (*a*) work in which the human body acts alone; (*b*) work which calls the arm muscles into action; (*c*) work calling the leg muscles into action; (*d*) varied work.

In practice, work is a mixture of the different elments enumerated above; it is possible, however, to determine the predominate character from the standpoint of physical work executed.

For the physiological definition of moderate, hard and maximum work, DILL proposes the following classification: moderate work will correspond to an expenditure three times lower than the basal metabolism; hard work to an expenditure between three and eight times as much and maximum work more than eight times.

Within the limits of hard work would be included: building industry, the mining industry, agriculture and military service during war-time.

The simplest is to divide, as did early investigators, the workers into three classes: *light*, *average* and *intense* physical work, at the same time recognizing that those who furnish intense work are not many: certain heavy manual labourers, field and industrial crop workers in certain seasons.

Energy requirements according to profession

Physical or intellectual professional work, owing to its ever increasing specialization, provokes certain reactions in the human organism and it is necessary to prevent eventual undesirable consequences, if it is wished to maintain the professional capacity indispensable for good output. In this respect, an appropriate alimentation constitutes a very valuable factor.

In present times, muscular work is less intense than it was fifty years or more ago. Operating a harvester, for example, is less tiring than using the scythe; the wood-cutter who guides the electric saw does not toil like the wood-cutter who plied the axe half a century ago; also the working hours before were longer than they are now; thus, all the early calculations are generally inapplicable to the present-day worker.

It is demonstrated that the intensity of muscular work or of nervous output varies from one calling or occupation to another and the same variation necessarily affects the energy expenditure and, consequently, food requirements.

In regard to the requirements in energizing principles, on the basis of data supplied by different investigators, the following figures expressed in gross calories have been proposed for the average individual:

Intellectual work	2,400	Calories	
Average physical work	3,000	»	
Intense work	3,900	»	and over

or, per kg. and per day, for these three classes of work: 36, 45 and 58 calories. In winter, these figures will be multiplied by 1 and, in summer, by 0.9. The necessary corrections for age will be made; it will be remembered that the figures are given in gross calories.

At the meeting of the Commission (Geneva) in 1936, different figures were given, as: average individual not working, 2,880 gross calories; individual carrying out light work for 8 hours a day, 3,600 gross calories; individual doing average

work 8 hours a day, 3,600 to 4,300 gross calories (per supplementary hour about 100 supplementary calories); individual doing intense work, over 5,800 gross calories.

But from what number of calories and prolonged for how long would an inadequate nutrition be dangerous, we cannot say and we can only indicate these two figures: 2,400 gross calories, strictly speaking, are sufficient; 1,500 calories expose the individual to serious disturbances.

Formulary to be utilized for establishing the scales of equivalence of energy requirements.

(Health Organization of the League of Nations, June, 1938).

Individuals	Basic ration (in net calories)	Energy supplement		Total ration (in net calories)	Scale of coefficients	
		Number of hours	Number of supplementary calories per hour of work		Unit 2,400 net calories	Unit 3,000 net calories
Men from 20 to 59 years:						
Sedentary	2,400	—	—	2,400	1.00	0.80
Light muscular work . . .	2,400	—	—	—	—	—
Average muscular work .	2,400	—	—	—	—	—
Intense muscular work .	2,400	8	75	3,000	1.25	1.00
Very intense muscular work	2,400	—	—	—	—	—
Men over 60 years old . . .	2,400	—	—	—	—	—
Women:						
Ordinary life.	2,400	—	—	—	—	—
Household work	2,400	—	—	—	—	—
Pregnant carrying out household work	2,400	—	—	—	—	—
Nursing and carrying out household work.	3,000	—	—	—	—	—
Boys:						
Between 15 and 19 years.	2,400	—	—	—	—	—
Between 12 and 15 years.	2,400	—	—	—	—	—
Between 11 and 12 years.	2,160	—	—	—	—	—
Between 9 and 11 years.	1,920	—	—	—	—	—
Between 7 and 9 years.	1,680	—	—	—	—	—
Between 5 and 7 years.	1,440	—	—	—	—	—
Girls:						
Between 15 and 19 years.	2,400	—	—	—	—	—
Between 12 and 15 years.	2,400	—	—	—	—	—
Between 11 and 12 years.	2,160	—	—	—	—	—
Between 9 and 11 years.	1,920	—	—	—	—	—
Between 7 and 9 years.	1,680	—	—	—	—	—
Between 5 and 7 years.	1,440	—	—	—	—	—
Little children:						
Between 3 and 5 years.	1,200	—	—	—	—	—
Between 2 and 3 years.	1,000	—	—	—	—	—
Between 1 and 2 years.	840	—	—	—	—	—
Under one year	—	—	—	—	—	—

We reproduce below, *in extenso,* the latest proposal of the technical Commission of the League of Nations.

"For muscular activity, the following supplements must be added to the basic ration: light muscular work, up to 75 calories per hour of work. The figure of 600 calories (75 × 8 hours) per day should, in any case, be considered as average supplement for muscular activity.

Average muscular work, 75-150 calories per hour of work. Intense muscular work, 150-300 calories per hour of work. Very intense muscular work, 300 and over per hour of work.

For a child or adolescent in good health, the muscular activity requires supplements to the basic ration.

The Commission considers that the muscular activity of children from 5 to 11 years is equivalent to light work for both sexes, to moderate work for boys 11 to 15 years old, to light work for girls from 11 to over 15 years.

It is not possible to suggest the adoption of a sole table of universal application as the energy requirements vary considerably from one country to another —and even in the limits of only one country—under the influence of various factors: difference in the length of working day, activity of the individual, average stature, environmental conditions (climate, etc.). The Commission, therefore, prefers to abstain from proposing a sole series of figures intended to express the totality of the energy requirements of each category of individuals.

These figures, however, are necessary for establishing the 'scales of equivalence'. For this purpose, the Commission advocates the utilization of the table reproduced on p. 30.

Column 1 indicates the 'basic' energy requirements fixed by the Commission; column 2, the average number of working hours during which the individual displays a special activity; column 3, the average horary ration in calories necessary to maintain this activity; column 4 will contain the total ration of calories calculated on the basis of the figures given in columns 1, 2 and 3. Columns 5 and 6 are destined for the scales of coefficients expressed in decimals of the unit adopted, whether this corresponds to 2,400 or 3,000 calories.

The decimal coefficient to be entered in the one or other of these columns expresses the ratio attributed to each individual (column 4) and the unit chosen".

Apportionment of work and repose

The distribution of work during the day may be based on the curve of KRAEPELIN, in which the output depends on the hour of the day: using this curve, an output of 10 to 20 per cent. higher is obtained. Work being divided into two parts—before and after midday—the curve shows a progressive increase (maximum at the second or third hour) and subsequently decreases up to midday; in the second half of the day, the curve is similar but the maximum is not so high and the decline towards the evening is more pronounced. In continued work, the two curves unite in a level line with a subsequent more marked descent towards the end.

The *intervals of rest* should not be too long. Brief and numerous interruptions are preferable. The interval for the midday meal must be taken into consideration and work should not be begun immediately after ingestion of food. For the same reason, a heavy meal should be avoided.

The longest interruption should take place at half or two-thirds of the working day.

The energy expenditure varies according to the different hours of the day; the maximum occurs from three to seven hours in the morning, for the man at rest or at work. On the other hand the intercalation of meals raises the expenditure in a proportion which modifies the nature of the food. The increase in expenditure consecutive to the meal ceases immediately if, for example, this latter consists of carbohydrates. Moreover, the expenditure progressively decreases up to the third and fourth hour. The initial increase is accentuated up to the third hour, if the diet is nitrogenized, and then stops.

Work after meals is carried out under unfavourable conditions, the systolic wave already augmented by digestion, increases still more proportionally to the work.

Experience has shown that hard and prolonged work does not lead to training. On the contrary, exercise of a reasonable duration produces a considerable effect on the adaptation of the organism. On the other hand, the unilateral effects of professional work can be compensated by appropriate exercise.

It would be advisable to apply to the apprenticeship of adolescents the scientific data obtained from physiology and to organize professional work of the young in such a manner as to be able, through the work, to obtain the effect of training

The scientific laws of the organization of work today attain a very high degree of perfection; they instruct everyone, according to age, strength, sex, in the art of producing the maximum output, without fatigue; these laws also affect to a greater extent, intellectual output, but the importance of the problem of alimentation has not yet been sufficiently understood.

As regards the *question of workers' spare time*, rapid progress has been made; it is known fairly accurately within what limits the work output can be increased by the rational utilization of spare time.

V. — Study of the individual capacity of man at work

The human being when born is endowed with a certain number of hereditary aptitudes which are the basis of the ulterior development of his organism. The genetic type (genotype) determines the possibilities and limits of future output.

The degree of influence to be accorded to external surroundings in the formation of a being in view of its adaptation to the conditions of life (phenotype) has long been discussed. Environment, however, usually plays an important part in the formation of the human being, although research has proved that the innate basic influence presents, as regards the final outcome, greater

importance than the environment. In each being, there are more possibilities of development than is realized. In fact, there is never a full expansion of the innate faculties. The formation, through education, of any ideal type encounters the great difficulty that we cannot define earlier enough the hereditary bases and that, on the other hand, it is very hard to create an environment exactly suitable for the purpose considered.

As regards the definition of environment, this is not so simple as might be thought. The influence of all the cellular tissues on each other is found in the embryo in the course of development and continues in the adult. This action may be of a physico-chemical nature or be transmitted through the intermediary of the nervous system. Numerous investigations have shown the importance of the reciprocal hormone action of the endocrine glands of the organism. These glands, on the other hand, are connected with the central nervous system and the organs through the intermediary of the sympatheticus. BUYTENDYK stressed the importance of the bonds uniting the emotions and the movements of expression to the glands of internal secretion, through the intermediary of the nervous system; reciprocally, the composition of the blood is not without influence on the emotions and their expression.

Studies on the constitution from the very first have taken into consideration the morphological studies of the human body. External measurements do not suffice for the definition of the constitutive type, the innate tendencies peculiar to the glands, the organs and the blood, must be adjoined.

Morphological constitutive types

Morphological types have long been known. According to SIGAUD, the classification is as follows: (1) *respiratory type*; (2) *muscular type*; (3) *digestive type*; (4) *cerebral type*. KRETSCHMER establishes three types: (1) *leptosome type* (asthenic): characterized by a poor development in breadth, normal growth in length; slim, tall, thoracic cage long and flat, extremities with poorly developed muscles, cranium short, lower jaw poorly developed, adipose layer thin; (2) *muscular type*; skeleton, muscles and skin very strongly developed, stature average or tall, shoulders and thorax broad, bone and muscles prominent, face is broad, the lower jaw well developed; (3) *pycnic type*; average height with deep and prominent thorax and fatty abdomen, the extremities fairly large, rounded, flaccid, without showing bone or muscles. The head, like the body, is broad and rounded, the adipose layer is very thick.

In reality, the pure forms are relatively rare and the transition forms are in the majority.

KRETSCHMER endeavoured to establish a correlation between the conformation of the body and the physical tendencies of the individual.

The Italian school proposed a classification in three groups: (1) trunk broad, extremities short, corresponds to the apoplectic habitus (macro-splanchnic of VIOLA); (2) small trunk, extremities long, phthisical habitus (micro-splanchnic of VIOLA); (3) normal trunk, extremities normal, habitus normal (normo-splanchnic of VIOLA).

The schema of WEINDENREICH comprises two types: (1) *leptosome*, characterized by development in length; (2) *eurysome*, characterized by development in width. The other forms are derived from a mixture of these two. According to SKERLJ, the athletic type (muscular) would also be derived from these two forms.

Further mention will be limited to the constitutive types established according to the property which the red globules possess of being agglutinized by the serum or the plasma of another individual and the types established from the innate tendencies of the internal secretion glands.

The determination of types of constitution is of great importance from the viewpoint of capacity for effort.

The respiratory or leptosome type easily becomes adapted to prolonged effort; the long and slender muscles have no tendency whatsoever to hypertrophy, although their strength increases during training. The muscular type responds to heavy and static effort.

The application of human biotypology is difficult if only based on a few observations and disconnected investigations; it is necessary to introduce the individual report-book, with a complete description of the past, augmented, *inter alia*, by the knowledge of personal aptitudes, which would give the key to effective action and would form the basis of a true organization of work. This action is on the way to partial realization in some countries.

Human biotypology

There now exists an ensemble of methods and techniques which constitute a new science in full development; this is *human biotypology*, which responds to scientific and practical exigencies.

The study enabling the state of nutrition of an individual to be defined comprises primarily a biotypological research (*).

The biotypological method is based on all the resources of modern science and biometry, psychography and psychometry. It is capable, better than other method, of revealing or fully evaluating, for a determined individual, in the first place, the genetics of the personality, the hereditary factors of the form of the body, the functional and psychological tendencies and morbid predispositions.

This method is also connected with the study of the conditions of climatic and social environment, in which the individual has grown up; it specifies the congenital morbid factors, the *food habits*, education, type of occupation and all other conditions capable of modifying the physico-psychic constitution of the subject, during the pre– and posti-natal formation of the individual.

(*) E. L. Methods for estimating the state of nutrition. Bull. Agr. Science and Practice. I. I. A., 1940, No. 9, p. 315.

The study of the biotype is based on fundamental morphological criteria as, for example: the development of the total mass of the body, given by the height, the weight and the ratio between the two; development of the chief organs (skeletal, muscular, circulatory, respiratory, digestive, etc.).

The evaluation of a human type according to the development of the mass and the proportions of the body may, in practice, be based on special measures compared with the average measures fixed by the statistical method.

For the scientific morphological study of the biotype individual, at least ten fundamental measures are used, but for rapid practical investigations regarding a large number of subjects (factories, schools, etc), use is made of two indices or quotients which result from the class mensurations of the stature, weight, average thoracic perimeter comprised between maximum inspiration and minimum expiration. By simple division of the stature in centimetres and the weight in kilograms by the average thoracic perimeter, the two quotients are obtained: quotient of mass and quotient of proportion.

If this quotient of mass is compared with the stature of the individual, it can be established if the individual has a medium normal corporal mass (stature and weight of normal value) or an excess corporal mass (high stature and relatively high weight or else a deficient mass (stature below average and relatively underweight). If inferior to the average, the individual having a broad thorax in comparison with the stature, this type is known as *brevilinea*; if the quotient is higher than the average, the thorax of the subject being narrow in comparison with the stature, the type is *longilinea*; finally, it is *mediolinea* if the quotient of the relative thoracic perimeter is normal.

Thus, it can be judged whether an individual is *lomgilinea*, *brevilinea* or *mediolinea*, of normal or excessive or deficient weight, of normal or exaggerated or diminutive height. It is then necessary to examine the individual for normotonic, hypotonic forms, etc.

Examination affected with the different means will enable us to establish the morphological constitution of the subject as to whether it is sthenic or asthenic, etc.

Another phase of the study of the biotype is that of the endocrinoneuro-vegetative and humoral temperament and that of the functional capacities of the different organs and systems.

Still another embraces the moral side of the individual. It will be a question of determining the level of the psychic tonus, that is, the degree of sensitiveness, reactivity, rapidity or slowness of the psychism and of judging if the spirit is introverse or extroverse. It will also be possible to investigate the degree of willpower, attention, power of mental concentration, memory.

The individual should also be studied in his action and in the different conditions of his practical life. These may cause to appear from his somatic and psychic depths, aptitudes, latent powers, which could not be revealed by the examination of the subject under the usual conditions of life.

It is only by the establishment of these processes that it will be possible to attain the final synthesis, that is, the judgment which differentiates and fully evaluates the individual.

Conclusions

The *economic values of an individual* which may be utilized to obtain a good work output are:

(1) health; (2) value of the muscular motor; (3) value of the nervous system; (4) psychic value.

The ideal towards which the scientific organization of work tends, consists in a continued medical supervision throughout the life of the individual. If the scientific importance of this is indisputable, the practical importance is no less obvious. The introduction of the 'health report-book', 'biotypological report-book', 'physiological card' or 'Gesundheitspass' or 'Gesundheitsstammbuch', referring to the value of the individual, should be closely connected with the complete organization of human work.

Here, in its fundamental lines, is the method to be followed in the study of the normal man and his *economic value*. Likewise, his moral and social value should not be neglected. This value should be examined so that a full evaluation of his qualities in reciprocal relations can be attained.

In the method to be followed for the improvement of the individual, of his physique and his psychique, with a view to increasing effort, many points lend themselves to discussion.

Theorists often complain that the conclusions which result from their studies are not taken into consideration; unfortunately, there is always a gulf between scientific knowledge and practical application. Therefore, this gap between the empirism of organizators and the laboratories of physiological and psychological reserch must be bridged.

It is not the aim of modern industry as well as agriculture to use up man power as rapidly as possible, with the risk of impairing the health of the individual. On the contrary, the desire is to husband and improve it to the lasting interest of both the employer and the employee.

The physiology and psychology of the child and the adolescent may furnish indications and the indispensable methods to be followed to obtain the best physical results in rural populations.

It is on the growth and development of children—the most decisive period of life from the viewpoint of future output—that the perfect physical formation should be built.

It is chiefly during the early years of life that nutritional errors have considerable importance; for example, a deficiency in vitamins A and D, calcium, phosphorus and iron, causes rachitis, anaemia, etc. These and many other affections have a very considerable social importance, as they are the origin of incomplete development and consequently, in the adult, of numerous pathological conditions. In nutrition, as in all other studies in physiology, only an observation bearing on several generations counts.

The work done by man, therefore, should be organized according to the principles defined by modern physiology.

The scientific orgnization of professional work should enable man to utilize his muscular force to the best possible effect. All investigational methods should

be applied so as to bring forward the essential caracteristics to which the normal physique should respond. The different points of view should be brought together, that of the physiologist and of the psychologist and of the engineer.

Such an organization would be a source of riches; it would develop, without immoderation, the physical and intellectual effort of the worker.

The study of the individual capacity of man for work becomes a daily necessity and may be considered as a *new specialization*.

Today, and also for the reconstruction of the world because of the effects of war, it is necessary to assure the worker the conditions apt for the best output in order that he may gain his living without stint and not find work a burden. It is necessary to see to the protection of health by means of the most strict organization of the hygiene of work, without which any improvement will be vain.

The maintenance of the human motor is complicated, the internal and external causes of deterioration, in particular, physiological distress, must be removed and the functional integrity must be watched by proportioning effort and speed.

Set work in a just proportion, this is the whole secret of high output and full activity, the way to which is open for research and realization.

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PROGRESS IN CHEESE RESEARCH IN THE UNITED STATES

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Cheese manufacture utilizes large quantities of milk in the United States, and frequently milk without utility for other purposes. During 1940 the cheese industry used 6 per cent. of our milk supply. A total of 3,000,000,000 quarts representing the production of 1,500,000 cows was used.

In the United States the art of cheesemaking is being aided by science. MARQUARDT and HUCKER (5) in 1926 were among the first to establish by the research procedure the importance of clean low count milk free from foreign flavors and odors in the production of quality cheese. Today these findings are accepted as common kowledge. Prior to 1926 there was a belief that a certain amount of contamination and growth improved milk for cured cheese purposes.

DAHLBERG and MARQUARDT (1) in 1923 described a procedure that improved the sanitary production of fresh cream cheese. This development aided increased cream cheese production in New York State which was 7 times greater in 1930 than in 1920. The technical advantages and sanitary features are noteworthy.

Ninety per cent of the cheese produced in the United States is American cheddar. Over 50 per cent. of this is made into processed pasteurized cheese. From a sanitary standpoint the advantages of consuming pasteurized cheese rather than cheese made form raw or pasteurized milk are obvious. The rapid growth in this industry is attributed to research. This industry offers splendid opportunities as a basis for greater utility for cheese and its products and cheese foods. The growth of the processed pasteurized cheese industry during the past decade is regarded as an outstanding development in the cheese industry.

MARQUARDT and NEEDHAM (7) in 1941 published results pointed to stress the value of curd strength control in cheese making. In the future the simple control of curd strength for cheese purposes will be a common practice as the relationship between curd strength within a given range and the proper texture in all types of cheese is basic. Work in this field was also conducted by MARQUARDT and HUCKER (6) in 1937 but the objective was to make cheese successfully from special milk.

Even greater than texture control is the control of flavor. Volatile fatty acids play an important role in cheese flavor development. Cheese foods and pasteurized cheeses will be prepared more and more on their volatile acid rations. With this in mind MARQUARDT and DAHLBERG have developed a definite technique to be published soon for estimating the volatile acids in hard and semihard cheeses and in cheese foods.

Salt control in cheese, and the relationship of cheese varieties to quality have been reported upon (3) in 1936.

At present a discussion concerning foreign type cheeses is timely. Some foreign varieties are not suitable for our trade. Others have the apparent disadvantage of long curing periods. Blue vein type cheese has been successfully made at several Experiment Stations and in the Federal Cheese Laboratory. There are over 20 blue vein type cheese factories in the United States today. They will soon produce more than we can consume but their future depends upon a quality cheese.

Trappist type cheese, regarded as a foreign type, is one of the few to be introduced as a result of being subjected to a program of research. In 1936 MARQUARDT (2) described procedures for making this type. The agricultural colleges taught the methods and commercial production on a limited scale is a success.

In the event that Italian types are introduced extensively in our country the foundation work is well established. Some of our cheese experts are familiar with these varieties. Work done by MARQUARDT (4) in 1936 leads into a promising field for the smoked type cheeses. Unpublished material on the smoking of natural and processed cheese is available. Present accepted procedures used in smoking certain Italian types use two principles which are fundamentally wrong. If these varieties ever become popular in our country, procedures to eliminate some of the smoke procedure defects will be in order.

Sodium borate in curing rooms has been used to eliminate mold growth and rind rot. Five per cent aqueous solution of sodium borate as a cheese wash has also aided in this control. Some have achieved success in suspending the borax in the paraffin used to coat the cheese.

At present some effort is being put forth cooperatively by scientists, cheese buyers, and the industry to improve factories and equipment and to standardize procedures. There is also an organized effort to establish better composition standards. This offers some handicap especially with fresh cheese because demands vary in various sections of the country.

YALE (9) in 1940 made a worthy contribution to the semi-hard cheese industry. His purpose is to establish suitable standards for Limburger cheeses and to correlate these with pasteurization procedures.

This brief account stresses some of the achievements in cheese research during the past 15 years. Further attention will be directed toward a better understanding of curing to alter practices to reduce differences in flavor intensity due to season or pasteurization. The part of enzymes in cheese curing will also receive more attention. Special cultures and culture rates will be investigated to clarify some contradictory views in this field.

It is of more than passing interest to know that SAMMIS and BRUHN (8) in 1912 published what can now be regarded as the first high type research for the cheese industry in the United States. Prior to their work research efforts were confined mainly to checking experimentally facts commonplace in the industry. Besides this the work prior to 1912 characteristically lacked the type of approach which in our time can be established by statistical methods to be adequate to establish the issues under consideration.

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(3) MARQUARDT, J. C.: The salting and cooking of curds in the manufacture of several varieties of cheese. — *New York State Experiment Station, Bulletin* 670, 1936.

(4) MARQUARDT, J. C.: Modifying methods to change cheese flavors. — *New York State Agricultural Experiment Station Journal, Paper* No. 195, 1936.

(5) MARQUARDT, J. C., and HUCKER, G. J.: Effect of pasteurization and cooling of milk upon the quality of cheddar cheese. — *New York State Experiment Station, Bulletin* 534, 1926.

(6) MARQUARDT, J. C., and HUCKER, G. J.: Methods of making cheddar cheese from milk with a low curd tension due to latent mastitis. — *New York State Agricultural Experiment Station, Technical Bulletin*, 242, 1937.

(7) MARQUARDT, J. C., and NEEDHAM, Margaret: Rate of rennet coagulation and curd tension of milk with special references to problems in cheese manufacture. — *New York State Agricultural Experiment Station, Technical Bulletin* 257, 1941.

(8) SAMMIS, J. L., and BRUHN, A. T.: The manufacture of cheddar cheese from pasteurized milk. — *Wisconsin State Experiment Station, Technical Bulletin* 27, 1912.

(9) YALE, M. W.: Factors affecting the quality of Limburger cheese made from pasteurized milk. — *New York State Experiment Station, Bulletin* 253, 1940.

MISCELLANEOUS INFORMATION

The carnauba palm, the babassu palm and oiticica, useful plants of the arid and semi-arid regions of north-eastern Brazil.

The three plants named in the title are found in the wild state in North-East Brazil, a region the future of which depends almost entirely on drought control. The reader will have already seen in our Bulletin information on this region and also on the drought campaign begun by the 'Inspectoria Federal de Obras contra as Sêcas' [1]. It was thought that it would be of some interest to add some supplementary data, as the exploitation of these two palms and of oiticica contribute largely towards the maintenance of the population of the said region. The products which are obtained

[1] GEHLSEN, C. A., Measures taken in North-eastern Brazil for the control of drought and soil erosion. *Monthly Bulletin of Agricultural Science and Practice. International Institute of Agriculture*, Rome, 1941, Year XXXII, No. 4, pp. 117-133.

from these plants have recently started a fairly strong demand on the world market. The possibility of cultivating these plants, either in the regions of origin, or elsewhere, is a problem worth discussing. Our information has been taken from three studies, published in the series of reports of the Commercial Museum of the Colonial Institute of Amsterdam. Their author, C. van de KOPPEL, a forestry expert of the Netherlands Indies has carried out numerous investigations on the products of tropical-forests and has personally visited North-East Brazil [1].

CARNAUBA PALM

The carnauba palm (*Copernucia cerifera* Mart.) grows in the North-East of Brazil between l. 3° and 10° S. It is found both in the arid regions where the annual rainfall ranges from 400 to 600 mm. and in a humid climate where the rainfall is over 1200 mm. The amount of rainfall, therefore, does not appear to influence the distribution of carnauba palms, while a prolonged dry season constitutes a limiting factor. The carnauba palm is found exclusively in sandy deep soils, chiefly along the banks of large rivers. It is very resistant to temporary inundations; it continues growing even in stagnant water. On the other hand, during the dry season, its very long, vertical roots enable it to draw upon the water accumulated in the deep layers of the soil.

This palm attains a height of of 12 to 15 metres. Its growth is slow and it does not form a true trunk until 8 to 9 years old. The trunk for a long time remains covered with spiny protuberances, constituted by the petioles of the fallen leaves. It is on the flabelliform leaves that the vegetable wax is secreted, covering the entire upper and lower surfaces.

The wax is collected in the dry season, but always after the flowering period of the palms. The leaves are then cut and left to dry in the sun. Preference is given to young, unopened leaves (called 'olhos') which furnish a light yellow wax, though at the same time a few unfolded leaves ('polhos') are always cut. It goes without saying that for rational exploitation account must be taken of the regenerative power of the palms by avoiding the removal of too many leaves at a time. Contrary to the exaggerated data found in tropical literature, the number of leaves harvested varies, in reality, between 10 and 15 per tree per annum. The leaves are cut at three different times, giving the palm time to reproduce new leaves during the interval between two cuttings.

The drying of the leaves is carried out in a primitive manner and there is a considerable loss in wax which falls off the leaf in the form of a fine dust. Once dried, the leaves are taken to small factories where they are shaken to detach the wax. This is the primitive system employed. Endeavours have been made to improve the method, by cutting the leaves into strips before drying, or by using machines to separate the wax from the lamina. The wax thus obtained is fused, after which it may be filtered; the liquid wax is then left to solidify in wooden receptacles and then cut into irregular lumps about the size of a fist. These are the commercial product.

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(1) VAN DE KOPPEL, C., Plantaardige grondstoffen uit Brazilië en parallelen met Suriname en Nederlandsch-Indië. *Berichten van de Afdeeling Handelsmuseum van het Koloniaal Instituut*. Amsterdam, 1941, No. 164: II. De carnaubawas-palm (*Copernicia cerifera* Mart.). III. De oiticica-boom (*Licania rigida* Benth.) en zijn drogende olie. IV. De babassu-palm (*Orbignya martiniana* Barb. Rodr.) en zijn vethoudend zaad.

Our author indicates as yield 6 to 10 grams per leaf, which per palm would represent an annual output varying between 60 to 150 grams. Taking as a basis an average yield of 100 grams per tree per year and an annual production of Brazil at 10,000 tons, the number of palms would be 100 million which would cover—taking the number of palms per hectare as 53—an area of 1,900,000 hectares. It is quite possible, however, that these figures regarding number of palms and area covered are lower than the actual figures.

The trade distinguishes, according to colour and the absence or presence of impurities, five varieties of carnauba wax. This wax is in great demand for its hardness and for the brilliant and equal layers obtained on melting it. The melting point varies from 83 to 86°C.; it is this high melting point which makes carnauba wax useful for mixing with other waxes having a low melting point. It is used chiefly in the manufacture of carbon copying paper; it is also in demand to give lustre to leather (suit-cases, pocket-books and other articles), as well as for wax polishes. Germany, formerly one of the chief markets, has replaced carnauba wax with substitutes, while exports to the United States remain high. Compared with other waxes (beeswax, candelilla wax, ceresine, Japanese wax, Montana wax, ozocerite), carnauba wax has obtained top prices on the London and New York markets.

The quantities exported per year vary, during the period 1930 to 1940, between 6,000 and 10,000 tons for a value varying between 300,000 and 800,000 pounds sterling, 43 per cent. of the total exports dispatched from the port of Parnahyba (State of Piauhy), and 39 per cent. of those from Fortaleza (State of Ceará).

The carnauba palm furnishes other useful products. Like the sago palm, its pith serves for the manufacture of a flour, the terminal eye of the stem is consumed as a vegetable, the fruits are given to domestic animals, toasted they form a substitute for coffee, the leaves and wood are used as building material and the roots employed in medicine. These numerous uses recall the coconut palm; the economic rcle of *Copernicia cerifera* is, certainly, very important in all regions where it represents the sole palm of the local flora.

The future of the carnauba industry does not promise to be very favourable. Account should be taken of the too severe methods of cutting practised in the past and the little controlled exploitation of the palm groves. It is certain that yields higher than the present ontput could be obtained by introducing improved methods of exploitation and by modernizing the system of manufacturing the wax A firm in the United States is interested in the question and has explored, by means of an aeroplane named ' Carnauba ', the entire zone of palms. This reconnoitring was not welcomed as it was suspected that the intention was to introduce the industry of the wax into other countries.

A veritable cultivation of the carnauba palm probably would not be profitable. The age of full productivity of the palm, which is only attained after ten years, the low yields, soil requirements, constitute as many unfavourable elements. In speaking of competitive materials, the author mentions, *inter alia*, the licury wax, product of another Brazilian palm, *Cocos coronata* Mart., which is found growing wild in the State of Bahia. It is true that the exploitation of this palm has only begun quite recently and is still minimum, but, on the other hand, it is known that the yield of licury palms is much superior to that of the carnauba palms. The number of palms existing is estimated at 5 million. The prices obtained for licury wax are lower than those for carnauba wax, but this is due to careless preparation and not to the intrinsic character of the wax. Finally, it is reported that *Cocos coronata* is less exacting than *Copernicia cerifera* as regards soil requirements.

BABASSU PALM (*Orbignya martiana* Barb. Rodr.)

Our Institute has already called attention to the economic importance of the babassu palm, the kernels of which contain 67 per cent. oil [1]. In a table assembling the data received up to 1937, the continual increase in Brazilian exports of babassu kernels was shown. This tendency continues: Exports in thousands of metric tons:—1937: 22.0; 1938: 30.2; 1939: 48.8; the first half of 1940: 25.0.

Mention will be limited here to the further information found in the study of VAN DE KOPPEL, referring the reader to the afore-mentioned monography for previous indications. VAN DE KOPPEL reproduces a table regarding the area under babassu palm stands, according to which it would be 13,400,000 hectares for the whole of Brazil; the author himself, however, is sceptical as regards the exactitude of these figures, which only represent rough estimates.

There is considerable uncertainty respecting the botanical affinities of the babassu palm. A well known specialist, BURRET, supposes that the babassu palms of Maranhão belong to the species *Orbignya martiana* Barb. Rodr , those of Minas Geraes to *O. oleifera* Burr., while those of the Amazon Basin pertain to seven, those of Matto Grosso to three other species.

The data on the morphology and those on the yield per palm do not differ from those indicated in our monography. Attention is called to the comparative yields of the different oil-yielding palms: the babassu palm gives an average annual yield of 3.84 kg. oil per tree. For coconut palms in full production, this figure rises to 5.4 kg., for wild oilpalms to 10.1 kg., for the cultivated oilpalms of Sumatra, to 24 kg. It is probable, however, that the output of babassu palms will increase when put under cultivation.

The following are the secondary products obtained from the babassu palm: presscake for stock prepared from the residue left after crushing the kernels, 'farelo de babassu' (presscake ground into meal), 'fouba' (beverage resembling chocolate, prepared with the mesocarp rich in starch), finally the products obtained from sclerenchymatous and very hard endocarp. This substance is not suitable for the manufacture of buttons as is the case for the endocarp of other palms, but it furnishes an excellent vegetable charcoal which, according to Brazilian investigators, would find many uses. It has even been calculated that the potential production of vegetable charcoal obtained from all the Brazilian palm groves would be sufficient to meet the requirements of all the installations which will be established in Brazil to utilize the vast deposits of iron minerals. These, however, are theoretical conjectures and nothing has as yet been realized.

VAN DE KOPPEL estimates the potential production of the existing palm groves at nearly a thousand times that of present production. Even at a modest calculation, the potential production would be 20,500,000 tons corresponding to 13,500,000 tons of oil, while the actual production was only 26,600 tons in 1937, last year for which figures are available. It is the scarcity of manual labour and the lack of roads which check the bringing into exploitation of this wealth. The author also observes that the oil from the oilpalm has nothing to fear from the competition of babassu oil on the world market. Comparatively to the difficulties encoutered in North-eastern Brazil,

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(1) See Oils and Fats: Production and International Trade. Part I, p. 248. *International Institute of Agriculture, Series of Monographs on the principal agricultural products of the world market*, Rome, 1939, 345 pp.

it would be relatively easy to exploit all the latent riches in palm oil. In Africa, in fact, there are vast regions from where only the kernels serve for local usage and the remainder is entirely wasted. In view of the relative abundance of manual labour in these regions, it would be fairly simple to attain a more rational exploitation.

Finally, the different factors which oppose the establishment of large plantations of babassu palms are discussed: advanced age of the productivity of the palms, yields not profitable, shortage of manual labour. The chief obstacle, however, is the lack of machines for effectively crushing the very hard and resistant endocarp. The numerous attempts by inventors have not as yet given satisfactory results.

OITICICA (*Licania rigida* Benth.)

Oiticica oil has only recently made its appearance on the world market of drying oils. Before the appearance of Chinese wood oil dating chiefly from the time after the last world war, linseed oil occupied so to speak a position of monopoly. The United States absorb about 70 per cent. of the world production of Chinese wood oil. Plantations were established in the Southern States of U. S. A. with a view to becoming independent of China, the chief exporting country: the United States, however, have not succeeded in meeting their own requirements and always depend to a large extent on imports. The Sino-Japanese war having checked Chinese exports, it was necessary to search for other products which would replace Chinese wood oil. It was at this moment that oiticica oil drew the attention of the North American market [1].

It was known, since the second half of the last century, that the seeds of *Licania rigidà* ocontain a drying oil. In 1876, a small oil-mill was installed at Fortaleza, the oil being marketed exclusively in Brazil itself. The mill soon disappeared and it was not until after 1927 that other mills were established, one at Rio de Janeiro and another, in 1929, at Fortaleza; the product of these oil-mills served for local requirements, chiefly for the manufacture of varnishes. The first samples of oiticica oil arrived in Europe and the United States in 1930, but it was not until 1937 that the industry of the latter country began to take any real interest in this product. Here are the import figures, in thousands of tons, of oiticica oil to the United States, the sole country which interests us, Germany only having imported very small quantities; 1936 : 1.3; 1937 1.2; 1938 : 2.4; 1939 : 8.6; 1940 (six months): 6.0. The value of these imports is considerable and, for 1939, rose to 226,933 gold pounds sterling.

Licania rigida Benth. is a rosaceous plant. It is a tree attaining a height of 15 to 18 metres, but which impresses the traveller traversing the arid or semi-arid regions by its large crown of dark green and its dense foliage always fresh as the leaves do not fall, like those of other trees, during the dry season. It is easily understood that that the oiticica is a tree greatly sought after by both man and beast during the hot hours of the day.

Its geographical distribution seems to indicate that the oiticica demands an annual rainfall of 1,000 mm.; it grows exclusively along the banks of rivers, but prefers—contrary to the carnauba palm—high banks and is never found in sandy beds. The palms are widespread in the States of Ceará, Rio Grande do Norte, Piauhy and Parahyba.

[1] For Chinese wood oil, see also p. 234 of the aforesaid monography.

The seeds are covered with a thin, coriaceous tegument; the kernel represents 70 to 72 per cent. of the total weight and its oil content varies from 60 to 65 per cent.; in practice, however, only 50 to 55 per cent. is obtained, corresponding to an oil yield of 35 to 39 per cent. of the seed.

The seeds fall to the ground and are easily collected. There are some losses owing to the fact that the ripening of the fruit coincides with the rainy season and so a considerable quantity of the fallen seeds are washed away by the rain. Damage is also reported due to the attacks of the horned beetle (*Conotrachelus lateralis*).

There are two types of oil-mills, in one the oil is obtained by pressure, in the other by extraction. This latter type obtains higher yields (34 to 36 per cent.) than the former (28 to 30 per cent.), but the expensive installations make for a higher cost price in comparison with that of the press-mills. It will have to be calculated, therefore, which is the more profitable of the two processes. The press-cakes are suitable as stock-feed and are used solely as fertilizer.

Raw oiticica oil constitutes a viscous, creamy, practically solid mass, having a melting point of about 40°C. Maintaining it at a temperature of 225° C. for half an an hour, an oil is obtained which remains fluid and which is called 'oleo polymerisado'. Today, this is the sole export product, the crude oil which was exported at the beginning not being very stable and involving difficulties in subsequent treatment.

Oiticica oil is distinguished from other drying oils by its high specific gravity, as well as by its viscosity higher than that of any other drying oil. Added to varnishes, it dries very rapidly and forms a hard layer, though less resistant to water than that of Chinese wood oil. It is recommended to take advantage, by mixing them, of the specific characteristics of the two oils.

Estimations of oil yield per tree vary considerably. VAN DE KOPPEL considers all the information he has found on the subject as being exaggerated. His estimation of an average of 50 kg. seed per tree per year seems to be the true figure. By estimating the number of trees at a million and a half, there would be a yield of 75,000 tons of seed corresponding to a potential production of 22,500 tons oil.

The variation in prices paid for oiticica oil at New York exactly follow that for Chinese wood oil, the price for the former however, always being slightly lower. From the moment that the prices given at New York fall below 15 cents per lb., the exploitation of the trees in Brazil ceases to be profitable. The entire future of the Brazilian oiticica industry, therefore, depends on the imports of Chinese wood oil to the United States, as well as as on the development of the tung oil plantations in the Southern States of the United States.

An increase in the production of oiticica oil by the establishment of regular plantations in North-eastern Brazil seems, in the opinion of our author, to offer little success. The requirements of oiticica which demand moist or irrigable soils limit the possibilities of its cultivation. The land which it is proposed to irrigate could, more profitably, be given over to other crops producing good yields in a short time, while the oiticica tree only comes into productivity at eight years. VAN DE KOPPEL considers that its cultivation would be of greater interest in other states of Brazil having a more humid climate than that of the North-East. The federal interest of the Brazilian Union, however, is opposed to such enterprises. Who knows if other tropical countries where tung cultivation has been tried will not one day turn their attention to oiticica which will probably give higher yields in oil that aleurites, even if the quality is inferior to that of the latter ?

VAN DE KOPPEL in conclusion called attention to some species of *Licania* growing wild in the Netherlands Guinea; these are *Licania heteromorpha*, Benth., *L. macro-*

phylla Klotzsch and *L. crassifolia* Benth. Only the latter has been found of importance for the oil content of its seeds, amounting to 25 per cent. The exploitation of these species involves considerable difficulties owing to the isolation of the trees growing in savannas not easily accessible and unpopulated and to the dimension of the seeds which are only 1 cm. long.

If we have judged it useful to make this brief communication, it is because we consider that the development of the tropics in the future will depend to a great extent on the just world apportionment of possibile crops and on the attentive and zealous search for new crops, in particular, those opening up possibilities for regions as yet little exploited.

W. B.

BOOK NOTICES *

GAROGLIO, Pier Giovanni. *Trattato di Enologia.* Enciclopedia vitivinicola moderna in 5 volumi. Edito da ' Progresso Vinicolo ed Oleario '. Firenze, 1941, Vol. II, 723 pp., 244 fig., 93 diagr. Price of the five volumes: Lire 300.

Mention has abready been made in the April 1941 number of this very important treatise on œnology, the second volume of which has just come out. Despite the difficulties of the present moment, the five volumes will be published within the course of the year. A slight change in the order of publication will be made; the third volume on wine technology will appear last.

The second volume on microbiology and enzymology applied to the study of grapes, musts and wines, is divided into 10 parts.

In the first part, concise information is given on agricultural microbiology and enzymology. The second treats on the subject of alcoholic fermentation. The third which is the most important and comprises 246 pages, deals with microbiology applied to the study of alcoholic fermentation. The fourth part is a study on the influence of physical, chemico-physical and chemical agents on the activity of yeasts. The fifth part deals with engymes and enzymology. The sixth is on the biochemistry of alcoholic fermentation. The seventh describes the exact methods for determining the evolution of alcoholic fermentation. The eight concerns the microorganisms and chemistry of the non-alcoholic fermentation of glucides. The ninth deals with the chief break-down products of the glucides and microorganisms which cause disintegration while the tenth part is an ensemble of practical considerations applied to the fermentation of wines.

Among the subjects treated in this volume, several, owing to their originality and the importance given them, could be made into different separate monographs.

Some chapters are particularly interesting in view of the subject treated and which is discussed in a skilful and exhaustive manner. Of these definitely stand out the chapters of the third part of the volume on the study of the yeasts found up to the present in grapes, musts and wines; their development, propagation and behaviour through numerical increase.

This volume will be most useful not only to technicians in œnology, but also to those who study microbiology applied to fermentation industries, as well as to those who are engaged in teaching and experimentation and those studying questions of pure enzymology. It will also enable information to be attained on a series of problems little known up to the present and which will open up new vistas to one of the most important industries of agriculture.

A. P.

* Under this heading reviews are given of books presented to the Library.

IORGENSEN, Harriet I., & BLACKBURNE, Cecil I. *Glossarium Europae aviums.* Copenhagen, Editor Ejnar Munksgaard, 1941, 192 pp.

In this glossary of the birds of Europe, the 1st part, entitled *Glossarium*, consists of a list of 451 species of the most important European birds, the names of which are given first in Latin, in alphabetical order, then translated into the 17 principal languages of Europe.

The second part, entitled *Indices*, gives, in each of these languages, an alphabetical list of the names of the species mentioned in the *Glossarium*, with references to the corresponding pages of this.

In conclusion, an *Index librorum* indicates the chief works and studies on European and even North African birds.

This excellent opuscule in boards, easy to consult, constitutes a happy proof of the steadfast determination to arrive at an international understanding in this sphere, so as to facilitate the work of ornithologists, that of European stations for the marking of birds (by girdling) and that of the international organizations for bird protection. Besides these who are the most interested, whoever knows the difficulties of an international nomenclature in Latin and those still greater of giving, in the different living languages, the equivalents of the Latin names of animals and plants, will welcome the publication of this glossary and will acquiesce in the desire expressed in the preface that this book may promote international understanding in the linguistic sense as also in a more noble sense.

N. v. G.

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PROBLEMS OF PORCINE PRODUCTION IN WAR-TIME

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SUMMARY: Introduction. — I. The problem of porcine production in war economy. – II. Food supplies and the upkeep of pigs in war-time. – III. Problems of rural economy and breeding raised by porcine production in war-time. – Bibliographical index.

In modern war-time production, that of pigs occupies a place apart. It constitutes a branch of animal production in which forage products are most rapidly transformed into meat and fat, and which, owing to its wide range, is the most easily adjusted to demand. On the other hand, however, the pig requires food the greater part of which can be utilized directly in the alimentation of man. In times of food shortage, it was said that 'the pig is the chief competitor of man as regards food'. Moreover, the transformation of forage products into meat and fat necessarily involves inevitable losses in calories. If account is also taken of the fact that pork and pork fat constitute an essential part of the food of large populations in Europe and that pig-breeding in important producing regions is based partly on the utilization of forages obtained from distant countries with which all connexion is now cut off owing to the war, it must be recognized that today, porcine production is faced with problems, the solution of which is very important, both for the supply of food products during the war and for the reconstitution of animal production after the war.

I.

THE PROBLEM OF PORCINE PRODUCTION IN WAR ECONOMY

1. — Importance of swine production

It is almost superfluous to call attention to the importance of swine production. Pork and pork fat today form an essential part of human nutrition. In Europe, within the last decennaries, the consumption of pork has become greater than that of beef and unquestionably ranks first in meat foods. In extra-European countries, the importance of this consumption is increasing just as much (1) *. On the other hand, pork fat also plays an important part as an alimentary fat. Finally, in the economy of porcine production, a certain value should be attributed to the hides of the pigs (for the leather industry), the bristle and other by-products and waste products of these animals.

On the farm, the pig is the most important animal as regards the transformation of carbohydrate foods into meat and fat. This transformation being very rapid, the pig can be fattened in a short time and generally matures early; it is also very prolific. Production, therefore, can be rapidly renewed; the stock can be increased appreciably within a short time and consequently can easily be adjusted to meet the increased demand and varying circumstances. Another important fact: swine production can be economic even on the smallest scale and, in such a case, kitchen waste suffices as a food basis. The pig is also less exacting than other farm animals as regards upkeep, housing and litter, so that it is found chiefly in the small and medium-sized farm. Pigs can also be fattened outside the farm properly so called, both on a very small and on a large scale, provided that a suitable food basis is assured.

This brief review of some of the characteristic traits of hog production indicates its importance in war economy. In consequence of the growing demand for meat and fats for human nutrition, this importance is even greater today than it was during the preceding world war. In this respect, an indirect effect is also derived from the fact that, as a result of the much higher requirements today of fats for technical purposes, the sources of fats which could eventually supply fat utilizable in human nutrition, serve, nevertheless, exclusively for the preparation of fat substances for technical use. The production of margarine and artificial alimentary fats, which contributed largely towards meeting fat requirements in food, has been paralyzed in many countries through the war, as the necessary raw material materials are no longer procurable.

* The numbers in brackets refer to the bibliographical index given at the end of this article.

2. — The food bases of porcine production

According to SCHANDL (2), a sow of an early breed of today produces on an average in a year, 16 young; the weight of the young pigs increases by about 10 kg. per month so that at the end of a year they weigh approximately 100 kg. Thus, under favourable conditions, an annual production of 16 quintals live weight can be obtained from a sow weighing 150 kg.

It is evident then that this very large production necessitates large quantities of feed. In the modern intensive farm, a very considerable quantity of concentrate feeds are employed in hog production. To give but one example, in Germany, where the pig furnishes approximately 1/3 of the meat and 1/4 of the fat consumed (3), an annual production of 25-26 million hogs for slaughtering (and even 28 million in 1939) alone requires more than half all concentrates (4) and this requirement is equivalent to practically the total consumption of bread cereals (5). In the countries where hog production, in comparison with other branches of animal production, plays a still more important part than in Germany (as, for example, in the countries of North and North-West Europe where finished pork is produced), concentrate requirements for hog production, expressed in percentage of the total requirement in these feeds for livestock, are naturally higher still. The hog, and in particular the hog which is fattened up and which consumes the greater part of the feed available for porcine production, requires foods having about 80 per cent. digestibility, thus manifesting, as regards the quality of the foodstuff, practically the same requirements as those of man (6) and which constitute one of the most difficult problems of economy in war supplies. The majority of the aliments utilized by the pig (cereals, potatoes, skim milk, etc.) can also be used directly in human nutrition. When the crops are insufficient and it is difficult or even impossible to import foodstuffs, excessively large stocks of hogs may become dangerous competitors to man from the food standpoint, if their size surpasses the limits fixed by the disposability of food (7).

" In the alimentation of different peoples in different countries—writes MÜLLER-LENHART (8)— the two chief groups of foods: (1) of vegetal origin – (2) of animal origin, are very diversely represented as regards their quantity and nature. Present-day economy procures us our main food in the form of products of the soil supplied by plants; the food of animal origin, however, consists chiefly in finished products of the soil. This finishing, however, is accompanied by appreciable losses in nutritive values which vary according to the form taken. The total energy loss depends, in the first place, on type of production. Thus, in dairy production, 1 kg. of ' Getreidewert ' * (literally: cereal value) only gives 0.5 kg. GW in milk; in egg production it only furnishes 0.09 kg.

* The ' Getreidewert ', represented by the symbol GW, is equivalent to 3,500 gross calories, that is, the calorie content of 1 kg. of grain. It corresponds approximately to the quantity of energy expended daily by a man of average weight carrying out average work.

GW; in pork production, only 0.21 to 0.25 kg. GW. Energy loss, therefore, amounts to about 50 per cent. in the first case, 91 per cent. in the second and 75 to 79 per cent. in the third. The signification of these figures as regards food supplies is seen from the following example: Up to the age when ready for slaughtering (6 months), the pig consumes on an average 10 qls. of potatoes and 1.5 qls. grain. In Germany, man consumes annually approxinately 1.5 qls. potatoes and 85 kg. bread cereals. Consequently, 10 million hogs consume as much potatoes as 60 million men and also grain which would suffice to feed 20 million human beings" (9).

An exclusively vegetable diet, therefore, contains the maximum quantity of energy per unit of soil surface. This apparent advantage, however, purely theoretical, frequently pointed out in periods of unusual scarcity, as, for example, during the previous world war, cannot be fully utilized in practice. In the first place, a purely vegetarian diet is less savoury and has a lower biological value than a mixed diet also containing food of animal origin. A sudden change in diet resulting in the use of vegetal foods only, to the exclusion of animal products, would be an exaggeration which, despite a sufficient calorie content, would be noxious to the health (10). Moreover, man cannot exceed a certain limit in the consumption of bulky vegetal foods.

The principle sources of protein in human nutrition are precisely the foods of animal origin; for the supply of fat, it is essential to maintain the production of animal fat substances. Even from the standpoint of alimentary physiology, it would be a mistake to draw premature conclusions from the aforesaid energy losses sustained by each of the finishing stages in question. A production policy based on these data may be prejudicial as was seen in practice during the preceding world war. We will return to this question further on.

3. — Trend of porcine production during the world war of 1914-1918

To explain the facts learnt from the previous world war, it is necessary to say at least a few words on some of the stages of the thorny path which hog production then had to traverse.

What at first sight is surprising, is that the various countries entered into war without making any provision as regards their economic policy. Before 1914, the competent offices had not, so to speak, paid any attention to that which, in war-time, concerns solely the economy of alimentation; in the plans for mobilization, this aspect was entirely neglected. This circumstance had all the more effect in that a considerable part of the European food economy was based on an international division of output, conformably to the economic concept then general, so that, for example, the greater part of the hog stocks in Europe could only be maintained by means of imported feedingstuffs. The decline in import possibilities together with the increased demand for food products naturally affected hog production. Nevertheless, at the beginning, the illusion that the war would not last long kept the Governments from taking war economy measures during the first years and action was limited to isolated measures intended to remedy the most serious disadvantages. This, from the very

first, led to the squandering of the food stocks held and also of the products which had not yet been rationed.

In considering the measures taken at that time, which, in most cases, were not based on any previous work accomplished in times of peace and which showed no signs of methodical planning, but which resulted only from the requirements of the moment, a fairly clear idea of the problems of production which then arose can be obtained. These problems and their development naturally differed from one country to another, and it is difficult to bring them to one common denominator. It is impossible to treat on this evolution in detail according to chronological order and according to country, but at least a brief outline can be given of some of the problems which particularly stand out.

The essential point was that the State intervened more and more in the organization of economy measures which up to then had been free. This trend worked chiefly through the measures which, in the first place, directly influenced the extent of porcine production and, in the second place, indirectly regulated this production as regards food supplies, markets, and prices.

(a) *Direct effects of measures taken on the extent of porcine production*

At the beginning of the war, in many countries slaughtering restrictions were made with a view to husbanding porcine stocks. The increase in the requirements of the army, the purchases made, through fear of future shortage, by private individuals, and finally the apprehension of the hog owners (particularly in the industrial fattening enterprises) to whom the provisions in feedingstuffs appeared insufficient, all contributed to increased slaughtering. It is evident, therefore, that restriction in slaughtering could only be efficacious when hog owners could continue to procure the necessary feedingstuffs; otherwise it was difficult to prevent them from flooding the market with their hogs for slaughter.

Later, however, slaughter restrictions were imposed in order to remedy the losses already effected which had seriously reduced swine stocks. The majority of these restrictions only concerned certain categories of animals; thus, for example, in France (11) when, as a result of requisitioning, the swine stock suddenly dropped excessively, an ordinance was emitted prohibiting the slaughter of sows in pig and young pigs under 60 kg. in weight. Such measures, however, easily fell short of the mark, as cross-bred animals of no value were usually left for breeding and, in many regions, the shortage of feed and manual labour made it impossible to keep pigs over a certain age. On the other hand, similar slaughter restrictions as regards calves resulted in an appreciable drop in milk supplies at the dairies.

Among the measures which caused reduction in hog production, there was requisitioning by means of which an endeavour was frequently made to meet the increased requirements of the army and sometimes those of the civilians. It is easily understood that this requisitioning did not promote production and only procured temporary relief.

Even more radical measures were then taken by officially encouraging slaughtering, and even making it compulsory when it was deemed necessary to regulate

the hog stocks in proportion to the more restricted food supplies. For example, in Germany (where at first, slaughtering was also officially restricted) in the fear that the supply of potatoes would not be sufficient for the needs of the people if hog stocks were maintained at their normal level, partly dependent on imported feedstuffs, the number of hogs fell considerably. Besides a temporary interdiction regarding the feeding of pigs with potatoes suitable for man, beginning in 1915, 10 million hogs were compulsorily slaughtered (hog stocks on December 1, 1914 standing at 23.5 million head).

The result of this compulsory slaughtering was an increased, though not economic, consumption of meat. The Government wanted to utilize these slaughtered animals for tinned meat, but this intention was only partly feasible. In preference, the young animals were slaughtered as relatively speaking they required more feed, but their meat, however, was not very suitable for tinning, on the other hand, the communes which, according to the Ordinance of January 25, 1915, had to see to the conserving of the meat, in many cases had not the necessary technical experience, adequate staff nor proper storage (12).

Compulsory slaughtering was preceded by an increase in potato stocks, and it was soon seen that the farmers had been too conservative in their estimations because, in reality, there were enough potatoes, enough to meet requirements until the next crop. Consequently, the appreciable reduction in hog stocks could, to some extent, have been avoided. It may be noted that this slaughtering was also effected for the reason given above, that is, to save the potato supplies for man (9).

The serious consequences of the excessive reduction in hog stocks were soon manifested; high increase in price on the meat market, caused also by the compulsory purchase of preserved meat by the communes—inadequate supply of meat and fat, which contributed to render necessary, in 1917 and 1918, reductions in the stocks of dairy cattle in order to maintain the level in meat distribution—which in turn led to a decrease in forage production. Also many foodstuffs, formerly utilized by pigs, were employed for other uses.

(b) *Indirect effects of the measures taken on hog production*

Among the measures which indirectly influenced hog production, mention may be made of those which regarded: food supplies—the price of live hogs, pork and pork fat—restriction in the quantities of pork and pork fat consumed.

The direction of food supplying, undertaken in different ways, followed two aims: (1) assuring the supply of foodstuffs necessary to man and preventing their administration to livestock; (2) maintaining hog production as active as possible. In point of fact, in view of the decrease in food stocks and crop output, it was hardly possible to solve these two problems simultaneously. Finally, it was necessary to ration provisions and, by limiting appreciably the consumption of meat and its production, it was possible to procure the population a more or less moderate quantity of vegetable foods. An endeavour was also made to improve the situation by fixing maximum prices. The effects of these different measures are linked together to such an extent that it is hardly possible to study them separately.

The use of the apparently most simple measure: prohibiting giving livestock foodstuffs which could also serve directly for man (cereals, potatoes, etc.) was, especially in swine production, the most difficult to control and subsequently this system was adopted less and less. According to AUGÉ-LARIBÉ (11), this measure was not applied in France because the price assigned to wheat, relatively low in comparison with the high prices given for forage cereals, led the farmers to give their wheat to livestock. Naturally, this manner of proceeding had a demoralizing effect and, at a time when there was a bread shortage in the towns, increased the contrast between town and country. The difficulty of controlling the interdictions regarding the use of wheat as a stockfeed led to imposing the reduction of hog stocks or else to requisitioning all wheat crops and distributing the products case for case. Even these measures, however, applied separately, could still be eluded. Finally the situation became untenable when, for the direct consumption of the people, an ever increasing percentage of many products had to be reserved, and when the proportion available for livestock became ever lower, precisely at a time when the aliments formerly furnished as substitutes (forage sugar, molasses, etc.) could no longer be distributed in sufficient amounts.

Still more difficult was the case of maximum prices. At first they were established to assure the people, at bearable prices, the most essential foodstuffs. In consequence, they were only fixed for certain products, as, for example in Germany, for cereals and potatoes (in 1915); but no prices were fixed for slaughter animals and meat. The result was that the prices for livestock increased, and all the more so as foodstuffs became more and more rare. In consequence of the disproportion in prices, it became ever more profitable to elude the interdictions regarding giving these foodstuffs to livestock. Subsequently the price for hogs was also determined, but the only consequence was that cattle and sheep, for which as yet there was no fixed price, were given a more copious feeding and that dairy cattle were slaughtered or fattened. There was no organic coordination in the system of prices; the more forced economy was extended, the higher the prices increased in the uncontrolled section. Another consequence was that the foodstuffs evaluated at a low price (chiefly those consumed in large quantities by a large proportion of the people) disappeared from the market. This was the case, for example, for potatoes which, despite the previous compulsory reduction in hog stocks, could not be procured during the winter of 1915-1916. They were simply given to the pigs as the relatively high prices paid for these animals, together with the prizes granted for fat pigs, made this mode of using potatoes more profitable than selling them.

AEREBOE (13) characterizes as follows the agricultural policy of Germany during the previous world war: " The idea was always, first of all, to place a limit to the momentary poverty of the consumers and not to increase production for the future. The idea was always, in the first place, to satisfy directly the food requirements of man and it was forgotten that to do so, it was also necessary to feed sufficiently the livestock; nor was it taken into consideration that grasslands and meadows should serve not only for the maintenance of livestock, but also besides for the production of foodstuffs ".

Similar examples of the policy employed as regards prices and production in many other countries could be given. The situation was not much better as the fact proved that, at the end of the war, in all countries, conqueror, conquered or neutral, the swine stock was much lower than before the war. If we make particular mention of Germany, it is because there the position was the most difficult as the country was almost completely isolated, and because the experience acquired during the last war subsequently led Germany to establish a production system which is now applied or imitated practically throughout the European continent.

Before examining the principle of the experience acquired during the course of the economic evolution which was produced in the previous world war, it should be mentioned that an attempt was also made, by new methods, to procure supplementary foodstuffs, chiefly by collecting kitchen waste from urban households, which was particularly valuable for hog production. In this way, in fact, it was possible to obtain considerable quantities of alimentary substances; during the war, however, their nutritive value became less and less as according as man was more poorly nourished, the said waste always had less value. During the war, the manufacture of meat meal or tankage from carcasses and slaughter-house waste was developed appreciably. Despite the considerable efforts made, however, it was not possible, owing to the shortage of labour and coal, to utilize fully this source of aliments, particularly important for swine production.

Finally, mention may be made of the manufacture of alimentary yeast, on which great hopes were based. The high price of the raw materials, however, prevented the manufacture of a cheap product so that its use detracted considerably from the profitableness of the obtaining of animal products.

4. — Experience gained from the 1914-1918 world war

"The important lesson obtained from the world war—writes WOERMANN (14)—was therefore: In times of economic distress caused by the foreigner, a people may only furnish itself with sufficient of the chief foods needed for its existence if not only it meets its own requirements in bread cereals, potatoes and other foodstuffs, but also if the livestock receive as large a supply as possible of the indigenous forage products. If these conditions are not filled and if, in time of shortage, imports have to be heavily restricted, then the stock of meat and fat will necessarily suffer".

To this certainly just statement, it must further be added that war victualling as well as the policy regarding agricultural production, had to fail because the war found the responsible departments unprepared, both materially and spiritually. It inevitably happened that in peace time, sufficient supplies had not been made, consequently, nor reserve stocks of foodstuffs, all this when the self-sufficiency system was neglected. Even the statistical bases and methods of collection were defective, and thus using false returns, errors, like that of the wholesale slaughtering of pigs effected in Germany, could be committed.

It was recognized more and more that, to meet a methodical consumption, free economy was not suitable (12), and this opinion was confirmed by the necessity of basing food supplies economy exclusively on home production. Nevertheless, the organization of production in a consistent manner was attained relatively too late. The intervention operated in free economy by means of different measures of compulsory economy, which, however, allowed a certain liberty, checked production but did not direct it. For example, prizes were given to encourage the production of lard hogs; but this measure, in itself, did not procure any increase in foodstuffs and the only result obtained was that production was displaced and, in other branches of production which, besides, with difficulty reached the output demanded, there was soon a scarcity, which harmed the entire production of foodstuffs. The constant displacement of production and the increase in war economy measures exerted a coercive effect both on the producers and on the people and thus caused much injustice. There was even a fatal continuous coercion of production. Each restriction in animal production, made with the of aim increasing the quantity of foodstuffs for human nutrition, represented, on the other hand, a decrease in the production of meat and fat, and endangered provisions in this field.

5. — Endeavours made as regards autarchic production

The most recent efforts made in this sense are frequently based on the experience acquired during the world war of 1914-1918. In regard to swine production, they chiefly follow two aims: (1) adjustment of forage production to swine production—(2) adjustment of the latter to the forage basis.

Seeing that the most simple method of adjusting forage supplies to hog stocks—making up the shortage by means of imports—had to be eliminated with the self-sufficiency policy, it was necessary to transform the home forage production in such a way that, by itself, it could maintain the level of hog production. As an increase in the forage area does not generally come into the question as this increase would cause a decrease in another product, in the first place an endeavour should be made to increase unit production. One method of furnishing more forage, which has been found efficacious, is to cultivate catch crops. Another auxiliary means consists in improving methods of cultivation and conservation of forage by which serious losses can be prevented *.

The transformation of forage production is operated on the principle of maximum of nourishment obtained to the minimum unit of area: It is best to cultivate the plant which, per minimum unit area and with little soil requirements, supplies the maximum yields in nutrient substances. Conformably to this principle, for example in Germany, the area grown to root crops has continually

* With regard to the self-sufficiency policy for forage production, see the following articles: (1) I. MOSKOVITS, Self-sufficiency in fodder supplies. — *Monthly Bulletin of Agricultural Science and Practice*, 1940, No. 4, pp. 150-172. — (2) I. MOSKOVITS, Problem of protein supplies under the self-sufficiency system. — *Ibid.*, 1941, No. 3, pp. 85-104.

been increased in recent times because, per unit area, they furnish more nutrient substances than grain forage crops. In other words, more pigs can be raised from a given area of root crops than from an equal area of grain forage crops.

Taking as a basis the average yields obtained in the Reich, it is found that from an area grown to potatoes or sugar-beets, generally 2 to 3 times more live weight is produced than with fattening on barley (7) *. Consequently the use of barley for fattening began to be abandoned and be reduced to a minimum in the fattening rations of pigs. Moreover, the feeding of livestock with bread cereals had been (for other motives, it is true) prohibited in 1887. From that year cereals had to be substituted by crops produced in excess and which could be increased still further, as is the case for potatoes, sugar-beets and mangels. Thanks to this measure, in Germany a change was made in the forage basis, in the sense that first foreign barley and maize, then the native rye, were gradually eliminated from the feed ration. According to the investigations of WOERMANN (4) in 1934, the fattening ration still comprised 60 per cent. cereals and 40 per cent. potatoes. STAHL (15) stated that in 1938 it consisted of 63 per cent, cereals and 37 per cent. potatoes; this investigator says that the aim to be attained is a ration of 50 per cent. cereals + beet cosettes and 50 per cent. potatoes. On the other hand, WOERMANN points out that in 1939 the ratio is already the inverse of that in 1934, that is, the ration contains 60 per cent. roots and tubers and 40 per cent. cereals.

Naturally the sugar-beet and potato are not such important crops everywhere. The further away from the Alpine range towards South-eastern Europe, the more frequently it is found that maize holds first place in the fattening of pigs.

According as cereals were substituted by roots and tubers in pig fattening so, in general, important changes took place in hog-breeding; its centre of gravity was transferred to the root crop districts and the pig stocks which were chiefly fed with imported cereals must necessarily diminish. The wide use of roots and tubers poor in protein has also increased the need for protein feedingstuffs and thus it has become necessary to procure other supplementary protein foods or else to pass from rapid fattening up to fattening on the products of the farm enabling an economy in protein.

The reduction in home-grown fodder has obliged hog production to depend more closely on variations in harvest (3). These different questions will be treated in greater detail in the subsequent parts of this article.

The discussion of these questions involves the problems regarding the adjustment of swine production to the forage basis. This adjustment should only in exceptional cases consist merely of a reduction in stock; in general, it should not take the form of a decrease in pigs for fattening or even breeding animals, but only be expressed by the increase or decrease in slaughter weight (16). The basis of such an effect should be an exact determination of the food requirements of hogs. These may be calculated fairly accurately according to the number of

* See p. 67.

hogs for slaughter, their average weight on slaughtering, number of sows or young pigs. The following example (7) indicates the method of calculation. In Germany, 4.4 to 4.8 kg. ' Getreidewert' (GW) * are calculated for 100 kg. live weight produced, taking as basis an ultimate weight of 110 to 140 kg. On this calculation the annual requirement of concentrated feed amounts to 12 million tons; if the quantity of foodstuffs obtained from the harvests or through importation, deduction made for the amount necessary for human nutrition and seed for the next crops, represents less than 10 to 11 million tons ' Getreidewert', either the stocks or the slaughter weight must be reduced.

The transposition of hog production on the autarchic forage basis may be efficaciously assisted by an adequate market organization and by governing production by means of a proper price system (17). A well established price system assures the possibility of developing a hog production founded on a national forage basis; by suitably fixing the prices, the degree of fattening desired can easily be attained and the provisions of existing foodstuffs and hog stocks adjusted. In the organization of pig production, the very considerable influence exercized by the Government is decisive, so that it is particularly important to examine its various connexions with rural economy and food supply policy, with a view to establishing an effective basis for the policy of State intervention.

6. — Pig production in the present war

At the beginning of the present war, the hog position in Europe was characterized on the one hand, by a tendency to establish complete or partial self-sufficiency as regards hog production (tendency which has just been described and which was manifested in several countries), and, on the other hand, by diverse crisis measures which were applied in different countries during the period immediately preceding the present war. In the recent past, there was a period when all countries which, formerly, imported products for swine-breeding, began to increase considerably their own production, so that they reduced their imports more and more. The aforesaid crisis measures were then necessary to diminish, in any manner whatsoever, the hog stocks which had become too high. The exporting countries were obliged to adjust swine production to export possibilities; in many importing countries it was necessary to restrict, in some way or another, swine prouction which had suddenly become excessive and threatened to flood the market. Both in the importing countries and in the exporting countries which produced pigs using imported grain forages, the reduction in stock generally went together with a simultaneously increase in production founded on a national forage basis. As regards the details of these measures and the development of hog production during this and the preceding periods, ample information has already been given (1).

It may generally be stated that the last-mentioned measures, as well as the efforts aiming at self-sufficiency, contributed towards making hog production ap-

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* For the definition of this term, see p. 51.

pear more secure. To cite but one example, taken from FEIST (18), it happened in Switzerland, thanks to the quota system for pigs, adopted in 1935, which resulted in founding hog production on the national forage basis, that pig stocks could be saved during the war, while poultry was killed by the thousand, because the upkeep of poultry depended largely on imported feeds.

In any case, these preliminary conditions enabled swine production to pass from the conditions of peace economy to those of war economy, although stocks, at the beginning of the present war, were much higher than in 1914. In some countries, there was the further advantage of early reserve stocks, which frequently included feedingstuffs for livestock. Finally, from the beginning of the war, an endeavour was made to adjust consumption to economic production. Thanks to the extensive organization of agriculture which now exists in nearly every country (here also the progress made from 1914 should be noted), the direction of production was effected much more simply. The efforts made for the transposition and adaptation of the agrarian policy to war economy are now relatively better understood than before. The progress made in agricultural production since the previous world war as regards rural economy and technique also contributed to this end.

The aim of hog production in war economy should be to attain the full production capacity without deterring the producers, at the same time taking into consideration consumption requirements as well as the buying power and economic status of the consumers. The means by which an endeavour is being made to attain this end are much improved and more complete in comparison with the measures employed during the 1914-1918 world war. Today, however, it would still be premature to give a full review of all these measures. At the most, a summary indication may be given of the questions which at present seem to be the most important, chiefly:

(1) The procuring of feedingstuffs, especially taking into account in this respect, the use of bread and forage cereals.

(2) The necessary eventual reduction of pig stocks.

(3) The organization of the study of rural economy problems, particularly in regard to the establishment of the maximum price and the displacement of the forage basis.

As regards the very up to date problems of apportioning the consumption of the products obtained from the pig and the control of their use, these do not come within the scope of this article.

The policy regarding the supply of feedingstuffs and the problems of feeding livestock will be treated in detail in the second part of this article, while questions of rural economy will be studied in the third part. Here there remains but the question of elucidating the general problems relative to the feeding of livestock with cereals and to the reduction of hog stocks within the limits of the policy on the system of alimentation practised in war economy.

In respect of the use of cereals for feeding hogs, it should straight away be pointed out that bread cereals which may serve directly for the nutrition of man, must not be given to pigs in times of shortage, not only for economic but also moral reasons. Besides the bread cereals, properly so called, however,

this measure should be applied to all other cereals which, in case of a shortage in the former, are utilized for making bread. In this respect, mention should be made first of maize, then other less important cereals (millet, etc.). It should also be taken into consideration, however, that potatoes are frequently added to cereals in breadmaking. In any case, it is necessary in the first place to assure the supply of bread and other foods, and also to meet requirements for seed, and only those quantities of cereals not required for these main uses should be transformed, through the pig, into meat and fat (18, 19, 20).

In effect, in a great many countries, the feeding of livestock with bread cereals is categorically prohibited. In excluding their use for this purpose, that which is more than a formal protection is the sound price policy which results and the establishment of a just relationship between the price of bread and that of forage cereals which are authorized for feeding livestock. The aim to be followed should consist in that the farmer should not be compelled to sell his bread cereals at a low price while paying high prices for feedingstuffs; on the contrary, he should, spurred on by the advantage of an adequate price, sell his cereals spontaneously; in other words, the price alone of bread cereals should exclude the profitableness of their use for stock-feeding (21).

The more accurate adjustment of stocks of home-produced foods and the increasing difficulties involved in victualling again raised, in many countries, these questions:

(1) To what extent can livestock be maintained to the full?

(2) How can vegetable foodstuffs be distributed in times of shortage?

(3) Should an endeavour be made to supply the population fully or is it better to reserve a larger amount for livestock and thus produce them for human nutrition in an improved form?

It would be relatively simple to adjust animal stocks to the forage basis which becomes restricted, if serious problems regarding the victualling of the country and economic existence did not come into play at the same time. On the one hand, an endeavour must be made to increase the production of foodstuffs directly utilizable by man and, at the same time, to neglect nothing in the way of preventing the reduction of farm stock, with a view to the supply of meat and fat. The experience acquired in the previous world war has well shown how dangerous it is to solve simply this problem by means of slogans. In order not to repeat this error, measures must be taken beforehand to elucidate the masses (22). In this respect, the question could be based on the experience acquired during the last world war and it could be shown advantageously that, even if compulsory slaughtering procured an immediate relief in the food situation, this situation would subsequently become all the more difficult; it must also be taken into account that, within the last decennary the meat and fat requirements of man have increased appreciably, and that a sudden change in this diet would be severely felt. At the same time, it must also be taken into consideration that some plant products which are produced in abundance, cannot be completely utilized for human nutrition. In default of the corresponding livestock, these products cannot be suitably utilized and, on the other hand, no use can be found for the waste products

and plants which are not directly used as food for man. Despite all these considerations, however, since the aggravation of the war situation, it has always become more evident that, in some countries, it is impossible to maintain livestock at the pre-war level (Denmark, Switzerland, etc.). In the methodical reduction which has become necessary, attention was naturally first turned to hog stocks, partly because hogs consume concentrate feeds to the greatest extent, and partly also because though diminished, stocks can most easily and rapidly be built up again. In each case, however, reduction in stock must be preceded by an accurate census of the number of hogs and the quantity of foodstuffs available. Primarily, animals of poor breeding value should bé eliminated. Finally, it should be remembered that slaughtering must not be carried out indiscriminately and as far as possible without precipitation.

II.

FOOD SUPPLIES AND THE FEEDING OF PIGS IN WAR-TIME

1. General review

(a) *Forage bases*

What has previously been said has already shown that the possibilities and means of procuring foodstuffs constitute the fundamental problem of hog production in war-time. In normal times, the requirements in bread cereals and vegetable foods is usually fairly constant; in war-time, however, requirements become greater, so that in view of the difficulties involved in importing forage products, the forage basis appears contracted.

This state of matters affects primarily swine production. In fact, the alimentation of cattle and sheep, even if including large quantities of presscake, depends much more on the foodstuffs produced on the farm; it is also based, to a large extent, on pasture as well as on succulent fodders and roughage obtained from the chief crops and cash crops. On the other hand, pigs require easily digestible foods, the majority of which can be utilized directly by man, but they only obtain the quantities which remain after the requirements for seed and human nutrition have been covered. In war-time, it is necessary everywhere to base hog production on the use of the home products available and to direct it on the principle already mentioned: 'per unit of live weight acquired in fattening, utilize the minimum of productive area'. As has already been stated earlier on, under the conditions of production in European countries situated north of the Alps, this requirement is met primarily by root crops, which have become, in the course of years, the chief mainstay in forage economy. The fact, however, of basing hog production on the use of the products of these crops for fattening, which has a decisive importance in war economy (5), leads to further problems. These products (roots and tubers) are particularly poor in protein; for them to have their full nutritive effect, the addition of concentrates rich in protein is indispensable. Fattening by means of roots and tubers with the addition of protein constitutes one of the chief practical problems of the day, and will be discussed in detail in a special chapter.

The problem of an eventual change in food supplies is more difficult to solve in regions where root crops do not give sure and high yields, or else where they cannot be grown extensively enough to form the basis of hog production. This is particularly the case in regions producing maize where, at all times, this cereal has formed the staple food basis in pig production. For the rapid development of pigs and for the high degree of utilization of this food, maize surpasses all other grain by reason of its high starch equivalent and low content in crude fibre. It has the advantage over the potato of lending itself better to a regional forage compensation, being easier to transport.

Maize which has always served directly as a food for man, is now much sought after as a supplement to the cereals used in panification, and it is utilized in human nutrition even in those regions where formerly it was not utilized for this purpose. Although these uses might diminish the stocks of maize available for animal nutrition, it does not seem that, in the European maize producing regions, an attempt has been made to enlarge the forage basis in the sense of remedying an eventual shortage of maize by means of other forage products. In these regions, the quantities of maize available, therefore, determine the level of pig fattening; if a shortage in maize occurs, hog production would have to react by a reduction in its total.

The question of substituting maize by other feedingstuffs, however, is also of topical interest in Denmark, Sweden (23) and in all pig producing countries which formerly maintained it by importing maize in large quantities. As a substitution, an endeavour is made to utilize foodstuffs with a high protein content, barley, potatoes and oats. In the fattening of pigs, 100 kg. of maize can be substituted, according to HANSSON, by 105-106 kg. of barley—according to JESPERSEN, by 105-110 kg. of this cereal. As regards the nutritive value of oats, extensively used in Sweden, it is much inferior to that of barley and of maize. According to official nutrition tests carried out at Stockholm, in fattening hogs, 120 kg. oats are required to replace 100 kg. barley. On the other hand, to substitute 100 kg. maize, HANSSON considers that 120 kg. are required; JESPERSEN gives 135 kg. In this respect, it must also be taken into account that oats should not represent more than 50 to 70 per cent. of the nutritive value of the entire ration.

In war economy, particular attention should also be given to the efforts made to enlarge the forage basis. In this regard, the utilization of kitchen waste by the pig has, in the first place a special importance; while, in the country, kitchen waste has always been given to pigs, still, today, in the towns, a large part of these waste products is lost, either being thrown away in the dustbin or carried away to the rivers in the sewage. Now, however, these waste products are beginning to be collected and utilized in special pig fattening establishments the working of which has recently been the object of scientific studies (24). It was thus possible to verify good results. Kitchen waste, first cooked, was given to the pigs, as much as they could take, the animals also received, per day, a concentrate feed containing 600 gm. barley and 150 gm. fish meal. Older pigs obtained greater benefit from this diet than the young ones, probably because its protein content was not high enough for the latter.

The importance attributed to this movement is seen from the following example: in Germany in 1936, the 'auxiliary alimentation action' began. With the financial assistance of the urban communes, piggeries were constructed or rented, the collection of kitchen waste was organized, the means of transport were procured and all the necessary gear for the upkeep of a pig fattening establishment was installed (25). In 1940, the Reich already had 1037 of these establishments in full operation, and 250 others were being begun. These establishments were furnished with kitchen waste by 28.5 million people (approximately a third of the total population); the amount totalled about 17,000 quintals per day. With the quantity of waste brought, 134,000 pigs were fattened over 4 semesters. The annual production of pork amounted to 28.3 million kg., which, with the existing ration allowed, supplied food for 746,000 persons.

(b) *Should pigs be fed with a view to meat or to fat production?*

As has already been pointed out, there is a fairly close relationship between the quantity of foodstuffs available and their quality, on the one hand, and the weight of the hogs at slaughtering, on the other. In the maintenance of pigs, this point raises the following question: Should their diet be planned with a view to meat or to fat production?

The formation of fat increases with the degree of fattening; per unit weight, however, it necessitates about seven times more calories than in the case of meat formation (26). The production of a higher yield in fat seems to be the most advantageous when the high cost of fat formation is reduced by the simultaneous formation of meat, that is, if the formation properly so called of fat is produced only when that of meat has already attained a considerable proportion, *viz.*, in the heavy pig. The feed could be utilized more advantageously by producing as high a degree of meat as possible, as is the case with the Danish bacon pig, which has already been improved methodically through selection as regards its faculty of fully utilizing the feed given.

By suitably fixing the prices of the different weight categories, the most equitable degree of fattening from the viewpoint of common economy can be established very well. To this end, account is taken both of the total supply of foodstuffs available and the fat requirement. If the inadequate supply of protein aliments and the fat requirement are considered, a higher production of fat pigs would be desired; but the situation of forage supplies puts certain limits to this desire. Hogs fed with a view to fat formation necessitate, per unit increase in weight, greater expense in feeding, and, between these animals and meat pigs, the result is a difference in production cost which can only be compensated by a higher selling price. The exigencies regarding price fixing, however, although justified in themselves from the standpoint of rural economy, should today give way to the necessities imposed by food economy.

(c) *Rapid fattening or else fattening by means of farm products*

Another problem, closely bound up with the whole question and meriting close attention today, concerns the duration of the fattening period.

Experience has shown that by decreasing the concentrate ration, particularly the protein concentrate, a reduction is caused in the daily increase in weight, thus prolonging the period of fattening necessary to obtain the same slaughter weight. If the conditions created by the war make it necessary to replace the concentrate feed by a forage produced on the farm, having a lower nutritive value, it is advisable that the fattening properly so called should be preceded by a preparatory period called ' of the porkling ' in which no attempt is made to obtain a heavy daily increase in weight, giving these young animals, as basic feed, the forage products of the farm, *viz.*: is summer, young herbage, lucern and clover; in winter, forage beets. A suitable pasture accustoms these animals to consume the bulky forages produced on the farm.

The supplementary diet given during the ' porkling ' period has been studied by different investigators and the following indications are given on the question: According to HARING (19) it consists, per pig per day, in (*a*) 3 kg. of cooked or ensiled potatoes + 100 kg. of protein food or 1.5 kg. of skim milk — (*b*) 1 kg. of dry feed comprising 90 per cent. grain and 10 per cent. protein food. The animals also consume 3 to 4 kg. of mangels (well chopped) per day, that is, about 100 kg. a month.

According to GOLF and SCHÄFER (27), it is an advantage to divide the period preparatory to fattening into two parts: during the first weeks, there should be no economizing in the supplementary feed given in the form of crushed grain (approximately 900 gm. of grain + 100 gm. of fish meal per pig per day); subsequently, in the second part of the period, the amount may be reduced in the interest of profitableness (650 gm. crushed grain + 100 gm. fish meal).

During the period of fattening properly so called, profit is assured if a saving is made in the supplementary ration (650 gm. crushed grain; skim milk ration reduced from 4 to 3 kg.); this period, however, should only begin when the pigs weigh 60 kg.

The ' porkling ' period lasts from weaning of the young pigs up to a weight of 40 to 50 kg.; the average monthly increase in weight is about 10 kg. per pig; it is produced without fat formation, as the sole object is the growth of these animals. This preparation of the young pigs before fattening properly so called is the necessary condition for the rational execution of this with the bulky mixture of beets and potatoes; at the same time, however, this preparation causes a reduction in the consumption of the supplementary protein feed. According to the recent investigations of H. GUTKNECHT (Liebefeld, Bern, Switzerland), it was found possible to fatten a pig over the period from its birth up to a final weight of 100 kg., giving it 100 kg. barley, 600 kg. potatoes, 400 kg. herbage, 400 to 500 litres of skim milk (10).

Fattening by means of farm products has its importance even in normal times, especially if particularly heavy pigs (150 kg. and over) are raised. Its essential advantages are:

(1) Utilization of bulky matter, poor in nutritive principles, farm forage produced in large quantities, thus costing less and often being even unsaleable.

(2) Supply of protein given, for the most part, by the forage products of the farm.

(3) Reduction in the requirements regarding the constitution and resistance of fattened pigs and, consequently, also in the risks to which their production is subjected.

With this system, however, the duration of fattening is several weeks longer than the usual period. Nevertheless it will always hold first place in the production of fat pigs.

(d) *The technique of alimentation in fattening*

According to RICHTER (20), in fattening, alimentation must cover the following requirements: (1) the greatest possible economy in the protein supplement both for breeding animals and for fattening pigs—(2) greater use than formerly of the forage products of the farm and especially of protein feedingstuffs (cultivation of pulses—(3) application of a suitable technique in alimentation.

In this way, a true economy can be effected in feedingstuffs as has recently been proved on various occasions by unexceptionable scientific investigations. As examples only a few of the important results obtained will be mentioned.

SCHMIDT (26) suggests that, instead of feeding animals to 'satiety point', as was the practice up to the present, they should only be given, in one lot the quantity of feed which they can consume in about an hour. This principle is developed still further in fattening experiments with reduced rations (30), (31): twice a week, one of the two daily feeds is suppressed, so that each week, the quantity of feed usually given in 1 day is saved. In this way, it is possible to realize, in comparison with feeding 'up to satiety point', an appreciable saving in feed, representing 1/7 of the quantity given. The consumption of nutritive principles per kg. increase in weight was estimated as follows:

	Normal group	Test group
Starch equivalent	100	93
Protein	100	92

The fattening period was slightly extended, but the profitable utilization of the feedingstuffs was increased by 60-70 per cent. in comparison with the feeding to satiety system. This method also facilitates working operations which would be particularly advantageous on Sundays and holidays.

In Hungary, ZAJTAY (32) carried out tests on feeding with reduced maize rations.

SCHMIDT (26) sums up the results of these different experiments as follows: "We must therefore revise our former concept according to which 'rapid fattening = the cheapest fattening'. The highest daily increase in weight does not always guarantee the fullest utilization of the food; this may hold true while the pig is forming chiefly meat, but as soon as the animals at a certain age form both meat and fat, particularly high daily increases in weight are nearly always due to an abundant production of fat with a restricted formation of meat, with the consequence that they require large quantities of feed".

(e) *The feeding of breeding animals*

For these stocks, the supplying of feedingstuffs and the alimentation of young pigs and breeding animals are relatively much more simple than for pigs raised for fattening. With these animals, concentrates can be replaced, without serious difficulties or disadvantages, by the forage products obtained on the farm. Thus, the products from the cultivation of potatoes and mangels will successfully substitute grain serving for other uses. The necessary protein should be supplied, as far as possible, by green forage, pasture, ensiled forage and, should the occasion arise, by skim milk.

For old sows, it is sufficient, in summer, to let them browse in the pastures and clean up stubble in the fields; in the winter, they are given beets and limited quantities of potatoes, which must eventually be supplemented with 500 gm. of concentrate per day. Larger supplementary rations are given to the sows nearing time of farrowing. Concentrates should be reserved for the period immediately preceding farrowing and for the suckling period. It is advantageous to arrange so that farrowing coincides with the period when forage production is most abundant (15). For sows who are suckling, grain can also be substituted to a large extent by roots and tubers; they should be given them in abundance, as also herbage, chopped straw, ensiled fodder, various dairy waste and residues; in this way, concentrates can be largely substituted. During the suckling period, says LANDIS (10), economies in feeding should be made with prudence, otherwise the milk flow and consequently, the development of the young pigs may suffer.

It is an advantage to let the young pigs suckle as long as possible and wean them late; during this period, the sow should be fed as well as possible. In the fifth week after their birth, it is necessary to begin giving the young pigs concentrates: barley instead of wheat and eventually also maize. It is difficult to procure them the required protein; skim milk will have to do in place of fish meal. It is necessary to accustom the young pigs early to other feedingstuffs and make a virtue of necessity by giving them what there is available. Contrary to what was previously recognized, the feeding of potatoes and potato flakes in higher doses, to suckling pigs and breeding animals has given, according to recent experiments, good results. At a later age, the breeding animals will be able to have other products of root crops, in particular, mangels and sugar-beet cossettes. For as long as possible, in autumn they should be given green forage and cabbage, in this way, the requirement of protein feedingstuffs of animal origin will be much reduced. In winter, this reduction is obtained by feeding an ensiled forage rich in protein. As for potatoes, they are either given simply stewed or else ensiled after this treatment.

The forage basis in the raising of young sows is pasturage or else green forage feeding in the piggery. It is also advisable to give them, per day, 4 to 6 kg. potatoes + 100 gm. of a product rich in protein. The feeding of young pigs is more difficult. They must be given each day from 1.5 to 2 kg. of a substantial feed with 10 per cent. protein comprising a complete protein food + potatoes and potato flakes.

2. Problems of fattening effected by means of root crop products

The very recent change in the forage basis of a large part of the swine stock in Europe, resulting in passing from cereals to root crop products, and the importance of this change for war economy, justify a detailed study of the technical problems it involves. According to WOERMANN (5), the increasing importance of these products in the economic feeding of pigs, especially in fattening, is one of the principal technical conquests of modern agriculture. At present (under the conditions in Germany), the same yields in meat and fat as before the world war of 1914-1918 can be obtained from a cultivated area not exceeding 80 per cent. of that formally necessary. Apart from these advantages for public economy and others already frequently mentioned (greater facility of increasing yields by means of forage cereals, etc.), the increase in the use of roots and tubers for swine production is also justified by the fat that the hog utilizes them to a much more fuller extent than other species of livestock. STAHL (15) states that from 100 gm. of starch the pig produces 35 gm. of fat, and ruminants only 25 gm. With 100 gm. of sugar, the respective quantities of fat produced by these two categories of animals are 28 gm. and 19 gm.

For fattening pigs, the most important product of root crops is the cooked potato, of which the pig utilizes the organic matter to the extent of 97.8 per cent. On the other hand, raw potatoes are not of complete value for fattening, even if chopped up or crushed, as they contain unwholesome substances, the nature of which is not yet well known, their action not even being attenuated by ensilage (36).

According to WELPERT (37), in pig fattening the potato denotes the following properties: (1) its considerable digestibility and wholesomeness make it an excellent food for fattening — (2) its incomplete content in nutritive principles necessitates a supplement in the diet (by means of protein) — (3) the shortage of mineral salts must also be remedied.

The food value of the potato naturally depends to a large extent on its starch content (fecule). In practice, this fact is not taken sufficiently into account or else is excluded under the erroneous impression that a low starch content is compensated by a higher consumption of the food.

Thanks to selection work, it has been possible in the last few years to increase appreciably the starch percentage of the potato. In the reports on the results of selection work, the varieties of potatoes which contain 18 per cent. and over of starch are indicated. The following data, obtained from fattening tests, show to what extent the starch percentage affects the final fattening result (39):

To obtain 100 kg. increase in weight in hogs to be fattened, the following quantities of tubers had to be employed:

Potatoes having	12 per cent. starch	18.0 quintals
	14 » » »	16.5 »
	16 » » »	15.0 »
	18 » » »	13.5 »

In this regard, it should also be taken into account that, for 18 quintals of potatoes, the production and transport costs were 33 per cent. higher than for 13.5 quintals.

The question of supplementary aliment has a decisive importance as regards the successful outcome of fattening with potatoes. Previously it was advocated that crushed grain was not necessary in fattening, but the experiments of LEHMANN have proved that it is advisable to combine this feed with potatoes and give a supplementary ration of protein. Recently this question has had to be very closely studied scientifically, as any eventual saving in crushed grain and protein foods are of very considerable importance for public or common economy.

LEHMANN, who has thoroughly studied the question of fattening with potatoes, at first lay down the following rule: "Feed pigs daily with as many potatoes as they can eat and also give 1 kg. of a concentrate feed containing 700 gm. of crushed grain and 300 gm. of protein, preferably of animal origin".

The question of protein substances having to be treated in detail in the following chapter, there remains but to study the role and possibilities of an eventual reduction or substitution in supplementary rations of crushed grain.

RICHTER (42) considers that, if necessary, pigs could be fattened by means of the products of root crops and a supplementary protein ration (with the addition of a little chaff) alone; in this case, however, the protein requirement is very high and hogs show, in their general condition and digestive force, a certain susceptibility, which is fairly frequently evidenced by an attack of diarrhoea, an ailment which must absolutely be avoided in pigs for fattening. The ration of this supplementary product, which should consist of grain and bran or other by-products of milling, has been fixed at 700 gm. per pig per day. It may appear very small, in the west of Germany, to a pig-breeder who, up to the present, has fattened his pigs on grain only, while, in the east, the breeder who fattens his pigs chiefly on potatoes, has frequently been unable to obtain from his own crops the aforesaid quantity, which corresponds to the use of 1 quintal of grain per pig to be fattened. Now, experiments carried out on a large scale have shown that it is possible to reduce this small quantity of grain + bran to 0.5 kg. per pig per day without affecting the final result. On the other hand, if part of the supplementary ration consists in pulses, these take the place of crushed grain, the ration of which can then always be reduced.

According to a pamphlet published in Germany, in September 1936, entitled: *Futtervorschriften für Zucht– und Mastschweine* (Rules for the feeding of breeding hogs and pigs for fattening) (34), if there is not enough grain but sufficient potatoes, the fattening with potatoes tried serveral times by way of experiment, may be practised without the supplementary ration of crushed grain. In this, case, besides potatoes, the hogs are given, as a supplementary ration, 0.15 kg. of fish meal and 2 litres of skim milk, or else 0.25 kg. of protein food and, to regulate digestion, a handful of chaff or husks or better still, 0.7 to 0.8 kg. of whole sugar-beet cossettes. Given with the fish meal, the sweet lupin may also serve as a protein substance of full value. Naturally, if the ration of crushed grain is reduced; that of potatoes and the products of other root corps must

be somewhat increased. NIESCHLAG (40) also succeeded in replacing entirely crushed grain with potatoes; in this case, the increase in weight of the pigs was less than with the combined use of grain and potatoes, but the utilization of the food and the profit were sufficient and the results on slaughtering gave satisfaction. As has been seen, the opinions as regards the necessity and amount of the supplementary ration are not in complete agreement. On the other hand, an endeavour has also been made to substitute crushed grain with other foods combined with potatoes or potato flakes. LEHMANN (41) states that a mixture of 1/3 bran + 2/3 potato flakes produces, in fattening pigs, the same effect as crushed barley, both as regards consumption of the food and content of nutritive principles.

According to RICHTER (42), for pigs weighing over 40 kg. or else past the first third of the fattening period, part of the grain supplement can be replaced by artificially dried young green fodder, finely chopped or ground (beet leaves, lucern, clover, sweet lupin, various fodder mixtures). Maintaining a ration of 200 gm. crushed grain, up to 500 gm. of these fodders can be given per pig a day (quantity corresponding to about 14 per cent. in a dry mixture), without in any way adversely affecting the result of fattening *.

The following mixtures, each containing an *artificially dried* green fodder, have been found equivalent to 100 parts barley (41):

(1) 38 parts dried young grass + 62 parts potato flakes;

(2) 50 parts dried very young red clover + 50 parts potato flakes;

(3) 38 parts dried red clover beginning flowering stage + 62 parts potato flakes.

An attempt has also been made to use *fresh* green forage, combined with fresh or well cooked potatoes. The following mixtures were found to substitute 100 parts barley:

(1) 161 parts young grass + 218 parts cooked potatoes;

(2) 229 parts very young red clover + 176 parts cooked potatoes;

(3) 178 parts red clover ready to flover + 218 parts cooked potatoes.

Seeing that barley is very dry, these large quantities of aqueous green forages and potatoes are not surprising.

Sugarbeet cossettes and forage sugar are often substituted for crushed grain and starchy foods (42). Numerous experiments have demonstrated that approximately 50 per cent. of the grain may be replaced by these two products. According to the tests made in Sweden (43) wood sugar should be mixed with crushed grain or potato flakes in the proportion 1 : 2, so as to form 33 per cent. of the mixture. In Denmark and in the United States, the same conclusions appear to have been made. Wood sugar contains much glucose: 61.99 per cent. Its coefficients of digestibility are: 62.6 per cent. for fresh matter— 63.2 per cent.

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* In this respect, see in the *International Review of Agriculture: Monthly Bulletin of Agricultural Science and Practice*, Rome, 1941, Nos. 7 & 8, the study entitled ' Artificial drying of green forage crops ', and in particular, the article of Dr I. MOSKOVITS contained therein, pp. 252-278, under the title ' The nutritive value of artificially dried green fodders and their utilization in stockfeeding '.

for organic matter — 71.3 per cent. for N-free extractives. In the wood sugar + potato flakes mixture, the coefficient of digestibility for N-free extractives is equivalent to 89.1 per cent.; in the wood sugar + crushed grain mixture, it is 82.5 per cent.

Pigs eagerly consume mixtures contaning wood sugar. At the end of the tests it was found that these mixtures had given very good results and wood sugar may be considered fully equivalent to potato flakes for fattening pigs. Other experiments have shown that the mixing of these flakes with wood sugar is more beneficial for pigs than the flakes alone.

Experiments have also been carried out on the use of dried sugar-beet, especially when crushed, use which has grown considerably. According to BÜNGER and his collaborators (28), who replaced crushed grain with increasing quantities of crushed sugar-beet, this substitution augmented the consumption of food and increased the weight of the hogs. This was maximum in the group receiving ¼ crushed grain + ¾ crushed beet and, as well, 3.5 litres skim milk as protein food. SCHMIDT and his co-workers (44) have investigated as to whether it is possible to substitute part of the grain in the ration by dried whey. The pigs were given a mixture containing 50 per cent. crushed grain, 40 per cent. potato flakes and 10 per cent. sugar-beet cossettes, plus a supplementary ration of a protein food. In the first experiment, with the test group, all the grain of the ration was gradually replaced by dried whey, the maximum daily amount given attaining 1,400 gm. The higher the amount of whey in the ration, the worse the hogs of this group developed. This led to a disstaste for the product and consumption decreased. In the second experiment, utilizing the experience acquired, only 75 per cent. of the grain was replaced by dried whey, the maximum amount given being 825 gm. per hog per day. No essential difference was observed between the results of this and the first test as regards average increase in the weight of the pigs, consumption of the food and its utilization.

These examples will suffice; a longer enumeration would be beside the point.

Seeing that in war-time potatoes have to be economized (both for food and for industrial purposes), it is advisable, therefore, to widen the forage basis so as to include in the basic ration other foods produced in large quantities: in the first place roots, comprising sugar-beets, mangels, rutabaga and carrots. Where soil and climate are unsuitable for the cultivation of potatoes, these root crops have always been used as the forage basis in swine production; in recent times, however, their use has extended from year to year. This means that, per unit area, these crops furnish greater quantities of nutritive principles than the potato, fact which HARING (19) expresses by the following ratio: potato 2, sugar-beet 3, mangel 4. Utilizing these roots, therefore, means approching still more closely the principle of maximum food supplies from minimum unit area. Taking as a basis the average yields obtained in the Reich, the following table may be drawn up (4), (45).

The increasing importance of beets, especially sugarbeets, in fattening pigs, is also explained by the fact that the enzymatic digestion which takes place in the simple stomach of the pig, having a short digestive tube, enables this animal to utilize very fully the nutritive principles contained in sucrose foods, while

Yields in fattening pigs, per hectare.

Product employed	Yields in fattening in quintals per ha.	Remarks
Barley	5.70	
Barley + potatoes	8.71	
Potatoes only	10.14	
Potatoes + sugar-beet cossettes	11.65	Ration of cossettes increased by 50 gm. each week.
Potatoes + sugar-beet cossettes	13.09	Ration of cossettes increased by 100 gm. each week.
Ensiled potatoes + whole value sugar-beet cossettes	15.20	

ruminants absorb them to a lesser extent. With the pig, the starch equivalent of beets, fresh or dried, is a good quarter higher than that found for ruminants.

In using beets as a feedingstuff, the manner of preparation is particularly important, as also an adequate supply of complete protein. Sugarbeets should be chopped fine or, better still, crushed or ground. Cutting into cossettes or slices is not enough, as the sugarbeet is naturally hard, for which reason livestock do not consume it properly in the raw state. Cooked, it has not the nutritive value of the potato (15); with this treatment, it has not been found very satisfactory, as cooking loosened from the pulp, fibrils disadvantageous for the consumption of the product. Mangels are softer and more succulent than sugarbeets, but their lower content of nutritive principles is not sufficient for fattening. At the most, they may be used to increase the bulk of sugarbeets and stewed potatoes.

The potato has the advantage over the beet in containing less water, so that livestock obtain a larger amount of nutritive principles from its consumption. It has generally been found that it is not advisable to substitute completely the potato by sugarbeet; on the other hand, good results have been obtained with a basic ration composed of equal parts of potatoes and sugarbeets (15). Independently of whether the sugarbeet was given fresh or well dried, with this food the same increases in weight were obtained as with potatoes alone. When besides these latter, a larger quantity of mangels is available, ⅓ of the amount of potatoes can be replaced by clean, well chopped up good quality mangels, or else by rutabaga prepared in the same way; half even of this amount may be replaced by stewed potatoes; in many cases, the result of fattening carried out in this way was equal to that obtained using potatoes only (28), (42). The water in which the beets have been stewed naturally should be given to the animals with the feed.

In fattening with sugar-beet cossettes, it was found that the use of grain could not be entirely done away without detriment.

3. The problem of forage protein

As regards the supply of protein foods under the self-sufficiency system, detailed information has already been given elsewhere *. The problems which arise here are very similar: these two particularly draw special attention: (*a*) The exact determination of protein requirement — (*b*) Supply of protein substances.

(a) *Determination of protein requirement*

It is necessary to revise the method of carrying out this determination to ascertain, taking into account the changing of the forage basis, if the rations given to pigs up to the present have not involved any wastage of the valuable protein.

The importance of protein in the feeding of livestock in general, and in the fattening of pigs in particular, is due primarily to the fact that this nutritive principle, owing to its special value, cannot be replaced by any other (47). Owing to the great diversity of the number of proteins, their composition and their properties, it is difficult to have a clear conception of the question. Protein is necessary first of all to form the muscular tissue of the meat, particularly in the young growing pig, as the meat cannot be formed without protein; it is not fattened, it ' grows ' (47). A decrease in the protein supplement is only admissible when feeding is aimed at fat production, because, contrary to the previous belief according to which only the protein and fat in food serve to form the body fat, HENNEBERG and his follwers (KÜHN) proved that the principal source of fat is constituted by carbohydrates: starch and sugar (48). In contradiction to meat, fat can be formed by means of different groups of nutritive principles.

If, during the growth period, the pig obtains the necessary quantity of protein, not only is the raising of the pig cheaper, but its musculature develops normally, and the result is an animal which, during the subsequent fattening, will be able to take fuller advantage of the carbohydrates in the ration. This is the essential point in hog fattening (50). For the last forty years, the science of animal feeding has aimed at improving the method of fattening by means of substances rich in protein. The scarcity of these substances now necessitates the application of methods which seem long out of date; for this reason, these methods should first be tried out on the present improved swine breeds, which are both early breeders and meat producers (28).

The shortage in protein foods, in reducing weight in fattening effected with roots and tubers, results in: (1) prolonging the duration of the fattening period — (2) increasing the feed consumption per quintal of hog produced.

In giving pigs sufficient supplementary rations of biological complete protein, both the best increases in weight and the shortest period for fattening are obtained. With an average increase of 700 gm. per hog per day, the

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* See article of Dr I. MOSKOVITS entitled ' Problem of protein supplies under the self-sufficiency system '. — *International Review of Agriculture: Monthly Bulletin of Agricultural Science and Practice* Rome, International Institute of Agriculture, 1941, No. 3, pp. 85-104 T.

fattening period from 20 to 120 kg. live weight is 143 days. If the increase in weight is reduced, the duration of this period changes as seen from the following data:

Increase in weight per hog per day	Duration of fattening period
600 gm.	166 days
500 »	200 »
etc.	etc.

In this way, the carbohydrate requirement, in consequence of the basic feed, increases. For this reason SANDERS (49) asserted that the extent of swine production depends more on the quantity of carbohydrates available than on the absolute quantity of protein food of animal origin.

If the fattening period is prolonged by 30 days, with the same quantity of feed, only 5 instead of 6 hogs can be maintained, naturally representing an increase in production costs. Also, when the duration of the said period increases, the quality of the pig changes (it produces fat instead of meat), which, furthermore, may be absolutely desirable.

What is the proper dose of protein? LEHMANN fixed it (in the natural state) at 300 gm. per hog per day for fattening with roots and tubers. In recent years, energetic efforts have been made to test whether it is possible to economize in the costly protein foods. What has already been said clearly shows that the amount of protein should vary according to the age and weight of the pigs that is, according to the stage of fattening attained.

A decrease in the protein ration of less than 200 gm. per animal per day has a very unfavourable effect on the fattening of young pigs. As regards heavy-weight hogs, after a period preparatory to fattening in which they have received more feed *ad hoc*, they already consume with the basic ration (potatoes, for example) such large quantities of protein that, without adversely affecting the utilization of the diet, the quantity of protein substance added to 500 gm. of grain can be reduced to 125 gm. per hog per day. According to BÜNGER (53), up to 120 kg. the increase in live weight is influenced considerably by the amount of the protein ration. After 120 kg. the amount can be greatly reduced. This investigator considers that the minimum amount of protein to be given depends on the growth aptitude of the pig (to form meat), as well as the type of feed of which the pigs are allowed to eat as much as they like. In normal fattening with potatoes and for well growing pigs, up to 100 kg. live weight the daily amount of protein necessary is 250 gm. In the case of less substantial feeding and for slower growing pigs, the amount of protein is only 200 gm. The experiments of LEHMANN (48) show to what extent insufficient amounts of protein affect fattening and also, that although feeding exclusively with potatoes makes, theoretically, for the complete consumption of the nutritive principles, the increases in weight do not correspond to expectations.

Contrary to the previous opinion, which estimated at 300 gm. per hog per day the quantity of protein necessary, it is recognized today, in practice, that 230 to 240 gm. are enough; but, taking into account the formation of meat this is

Comparison between normal fattening and fattening with potatoes to the utmost (values in grams per pig per day).

	Feedingstuff		Increases		
	Protein	Total nutritive principles	Substances of the body without fat (meat, bone, etc.)	Fat	Total increases
Normal fattening	307	1,756	335	305	640
Fattening with diet poor in protein (potatoes)	128	1,672	38	300	338

the minimum limit. Experiments of BÜNGER and his co-workers (55) have proved that a decrease in the daily ration of protein under 200 gm. of digestible protein in the total ration falls appreciably below the optimum in fattening up to a little over 100 kg. live weight. A daily amount of digestible protein of about 220 gm. leads to practically normal increases in weight and may still be considered as sufficient. An increase in this amount above 250 gm. dos not effect an appreciable increase in weight, so that it should not be practised when protein foods are scarce. SCHMIDT and KLIESCH (54) also found that carbohydrates were most fully utilized when each pig is given daily 250 gm. of digestible protein, of which 50 to 100 gm. should be of animal origin. In the tests on fattening on output of fattening, this amount gives rise, in the period covering, between 30 and 70 kg., to a consumption of 2,600 starch equivalents to produce 1 kg. increase in weight. If this minimum limit is reduced, the hogs are smaller as the meat formation suffers; the fat formation, however, remains unaffected. In other words, the hogs have less meat, but more fat than normal animals. If the main aim is fat production, a pig fattened in this way should be preferred when fixing maximum prices. An example taken from practical experience, cited by LEHMANN (51), shows the difference between the production cost of a pig having little meat and much fat and that of a meat pig: " As with normal quantities of protein, in the fattening of slaughter hogs (final weight: 110 kg.), 600 gm. increase were attained per hog per day, about 400 gm. increase are obtained in fattening carried out with little protein, as can still be well effected in practice. These 400 gm. increase per hog per day, however, necessitate practically the same expense. For the same increase in weight, the expenditure of nutritive principles is, therefore, with the protein diet, only ¼ of that with the carbohydrate diet. Equitable quantities of protein attaining 250 gm. per hog per day lower the cost of fattening, because they produce chiefly meat, while the carbohydrates form fat".

In fattening and in determining the dose of protein, however, account should also be taken of the fact that present day swine breeds are quick maturing and there is a risk of them falling off in development if they are not given a little protein food between the third and fifth month of life.

When protein foods are very scarce and carbohydrates, on the contrary, abundant, a considerable reduction in the amount of protein to 175 gm. and even to 150 gm. may sometimes be justified. the duration of fattening and the consumption of carbohydrates are, it is true, much greater, but may still be bearable from the economic viewpoint (54).

As regards the protein requirement for rapid fattening using maize as the basic forage, CSÀKY (50) states that, to produce the pig of about 190 kg. much sought after in Hungary, 17 kg. of digestible protein are required, 11 kg. serving for production, while the other 6 kg. necessary for upkeep, may be supplied by the maize. The essential point consists in employing the quantity of protein necessary in equitable doses until the weight of 120 kg. has been attained.

(b) *Supply of protein substances*

The problem of the supply of protein substances in sufficient quantities is certainly one of the most difficult for war economy to solve on the European continent. It is particularly difficult to obtain these foods for swine production. In the first place, they should in a highly concentrated form, because the digestive apparatus of the pig cannot contain large quantities of bulky fodder or roughage which would be necessary to meet the protein requirement. Moreover, at least a part of the supplementary protein feed should consist of proteins of high biological value, of animal origin (skim milk, meat, fish, blood, etc.), which cannot be replaced by the protein foods produced on the farm (pulses, artificially dried grass, etc.). As is seen, the products which make it possible to solve the protein question in the case of bovine production (green forage, ensiled fodder, artificially dried grass, products of catch crops) may furnish, it is true, a limited assistance in swine production, but not the solution of the problem.

Among the protein foods of animal origin, skim milk could well replace those which formerly were imported. Numerous experiments have shown that, contrary to what occurs in fattening with crushed grain, when skim milk produces practically always higher increases in weight than fish meal, in fattening with potatoes, this meal given alone or else with an equal quantity of skim milk makes for a slightly larger increase in weight than with the use of skim milk only. Unfortunately, it is not often that there is sufficient skim milk available and fish meal is even scarcer. Among the other protein substances of animal origin, there are still butcher waste, tankage, fresh blood, cooked or dried. All these products are all more or less suitable for feeding hogs, either given alone or combined with other substances. Today, the essential is to procure them in sufficient quantities.

As has already been stated, protein foods of vegetal origin can only be employed in fattening as supplements to animal proteins, but not alone. The principal plant proteins are: pulses, artificially dried or ensiled herbage, and other plants rich in protein. The essential, however, will always be to know to what extent protein of animal origin can be obtained.

Finally, mention may be made of the experiments aiming at producing feedingstuffs rich in protein artificially. Among the most important for pig

fattening is wood-sugar yeast. Already during the world war of 1914-1918, an attempt had been made to produce protein by using a fermentable carbohydrate and inorganic nitrogenous compounds, mixture from which, on heating and drying, an alimentary yeast is obtained. Then this process could not become general because the molasses or sugar solution required as raw material did not fulfil the required conditions as regards price and quantities available. Now, however, the processes of manufacturing sugar and alcohol from wood and waste products offer fresh possibilities of development. In various experiments the food product in question was found to be good. The practical possibility of its use would depend on economic factors on which as yet no detailed information has been given.

III.

PROBLEMS OF RURAL ECONOMY AND BREEDING RAISED BY PORCINE PRODUCTION IN WAR-TIME

1. Problems of organization

It is evident that the present conditions also imply a fundamental change in the forms of swine production in use up to date. Modifications have had to be made both from the standpoint of common economy and from that of rural economy, and additional problems had to be set which at present are, it is true, for the greater part still disputed, but which perhaps will find a practical application according as the war continues.

The two factors which most definitely influence the forms of operating swine production would be: (1) war economy regulated by the State authorities with the system of maximum prices (2) the changing of the forage basis.

The fundamental problem of regulated swine production consists in coordinating together the economy of rearing, of pasturage, of forage production, labour and finally price policy. It would be entirely erroneous to test here solutions giving chief importance to the marketing of the products and to its as rigid organization as possible. Swine production is a very susceptible branch of farming, the extent of which various constantly and which also frequently depends on the disposition regarding production manifested by pig-breeders and fatteners. For this reason the different factors of production should be well adapted to prices: lean hogs, feedingstuffs, labour and final products (meat and fat), otherwise said of pigs for slaughter. At all times, hog fattening has been in the character of a speculation. The producer must be able to judge clearly the chances of profit and also be assured of a sufficient supply of forage products. This physiological factor is extremely important, especially in time of war. It is necessary, therefore, that the authorities, which direct production and thus assume several tasks previously accomplished by the producer hinself, fully understand this situation. The fact that the management of production is centralized imposes on the individual producer a certain amount of supplementary unproduc-

tive work. Thus the issuance of permits, a considerable amount of office work regarding the various declarations, statements and other matters which cannot be treated at the central office, frequently keep the producer away from his farm. The most simple matters which formerly could be settled in the commune by the administrative authorities, now often have to be treated at an office much higher up. It is desirable, therefore, that, where this situation does not yet exist, an extensive a decentralization of the authorities as possible be effected, so that the farmer may spend as much time as possible on his farm (56).

As has already been repeatedly stated, one of the most important tasks, but also the most difficult which are incumbent on the competent authorities, consists in maintaining swine stocks at the level necessary for public economy. If swine stocks are too large, the hogs consume too much food and, moreover, the increase in their production endangers the supply of bread and potatoes for the population. On the other hand, if there are too few pigs, not only does the the production of meat and fat fall to an undesirable level, but also there is the risk of the potatoes and other food products not directly necessary for man, not being suitably utilized, because they cannot be employed in the normal way as a feedingstuff (57). As already pointed out, swine stocks are not always adjusted to the quantity of food available in fixing the level, but also by determining the degree of fattening desired. This is adjusted to the desired level to produce more meat or more fat.

It directs production by means of a price system rather than by applying direct measures. To this end, the pigs are generally graded according to weight; by suitably establishing the prices of the different grades, production can be regulated at will, that is, the production of one class of pig may be encouraged, that of another restricted, etc. Naturally, the fixing of the prices of different foods and the proportion in which they are distributed also play a decisive role.

It is easily understood that it is not at all easy to regulate production properly and to employ effectively the means mentioned. Thus, for example, the fixing of the price of porklings or lean pigs for fattening may diminish production efforts owing to the fact that differences in quality are not taken sufficiently into account. It may also happen that, to husband food supplies, precaution imposed either by an unexpected poor harvest, or by a too rapid increase in swine stocks, it seems advisable to change suddenly the trend followed in production until then. In this case, the matter can be managed by momentarily giving a special prize for low weight categories, generally limited to a brief period, which thus spurs the pig fattener on to slaughter the animals rather than continue fattening them (57).

For the hog raiser, whose personal initiative besides is closely restricted, the problem of feeding and production appears still more serious by the fact that the prices of the final products (meat and fat) are generally determined officially, so that the costs of production, and in particular those which are fixed should be adjusted to the limits established (58). On the other hand, the central offices which determine the prices of the final products should also hold to a widely social viewpoint and take into account the buying capacity of the masses. The fact cannot be overlooked that the present war was preceded by long periods of

economic depression, which both weakened economy and seriously affected public finances (18). Even so, however, the prices must be fairly high to encourage supplying the market, so that the organized market may dispose of sufficient quantities of products for distribution and that there is no setting up of a ' clandestine market '. Other problems, no less important, have arisen owing to the fact that a change in the forage basis necessarily leads to certain seasonal and regional displacements in production. Statements of the ' Hauptvereinigung der deutschen Viehwirtschaft ' (Central Union of German Livestock Husbandry) regarding the supplying of 43 important markets show that the regions practising hog fattening with potatoes deliver their consignments chiefly in late autumn, winter and spring, while the regions where these animals are fattened on grain deliver their products chiefly during the summer months (59). As is known, from June to September, fattening on roots and tubers can only be effiected by ensiling these feedingstuffs. In the case of potatoes, there is no difficulty in ensilage; it is not so easy, however, with beet: ensilage hardly softens the sugarbeets at all and they become excessively acid and not very appetizing. The results obtained from other beets are slightly better, but they connot be ensiled without adding some substance to absorb the liquid formed, in particular, potatoes. A mixture of these with beets has been found very satisfactory. However, despite the appreciable progress made un recent times, ensilage has not attained the necessary development and it has not been possible by this means to prevent a momentary shortage of hogs for slaughter.

The changing of the forage basis may also give rise to very important displacements in the regional distribution of swine stocks and consequently in the opportionment of their production (60), (61).

It has already been indicated elsewhere (1) in figures, taking the example of the displacement of German swine production, what important changes could thus take place: the swine stock in North-West Germany which represented in 1930, 30.3 per cent. of the total stock of the Reich and was based almost entirely on the utilization of imported foods (85 per cent. of the barley imported and 2/3 of the maize imported) in 1935 dropped to 25 per cent. of the total stock while the swine production of Eastern Germany, based on potatoes, increased proportionately during the same period.

A regional compensation of swine production can only be effected with the drying of roots and tubers (dried sugarbeets, potato flakes) or with the feeding of grain (increase in cultivation of winter barley); with ensilage, only a local compensation of requirements can be realized. The compensation may be favoured by ' fattening contracts ' by which the hog fattener is pledged to deliver feeder hogs in exchange for feed supplies. In establishing the period of delivery these contracts may at the same time assist seasonal compensation in the delivery of hogs for slaughter.

In some countries, the trend in swine production and the fixing of prices are not uniformly effected throughout the territory, but (for special reasons) separately in the different regions or provinces. Certainly this system may have very unfavourable consequences on the rational disposal of the products; naturally the hog fattener disposes of his hogs where he gets the best price.

In many countries, an endeavour has been made to obviate these unfavourable consequences by instituting a ' local autarky '; but it was not long before this system appreciably checked production, on the one hand, in making food supplies in the different regions impossible and, on the other, in preventing the utilization of surplus food for lean hogs (63).

The changing of the forage basis is not easy as may be seen from the example of the Protectorate of Bohemia and Moravia. At the time of the Czechoslovakian Republic, hogs were almost exclusively fattened on grain (maize). After annexation to the Reich, fattening had to be carried out with roots and tubers, method which, despite the propaganda made, it has not been possible to realize fully as it necessitates considerable changes in the crop program and nutrition methods which take time (64).

2. Rural economy problems

There are also important organization problems to be solved in the farm itself. These problems naturally differ according to the type of farm.

In small scale swine production based on the utilization of kitchen waste, carried out independently of farm operation, war-time with the consequent shortage of foodstuffs, has frequently exerted a stimulating action. Certainly this form of hog raising has to contend with many difficulties; it is often affected by the fact that the necessary quantity of supplementary foodstuff can only be procured with great difficulty. In many countries, private slaughtering is also controlled and restricted. Frequently there is a partial obligation to surrender certain products (fat, for example), or else a minimum fattening period is prescribed in order to prevent the purchase of practically fully fattened hogs for private slaughtering. In Germany thanks to the activity already mentioned of the ' auxiliary food supplies association ', small scale swine production has taken on a new aspect; large special fattening establishments have been created on this forage basis (see p. 64).

In consequence of the extension in root crops and fattening with farm products, large scale or farm type of swine production has increased in importance in the potato regions, it constitutes the principal branch of the utilization of these tubers and thus forms one of the main supports in the farming of light soils. If today the farm type of fattening frequently holds a predominant position, it is also due to the fact that it was vigorously encouraged by the self-sufficiency movement, as well as by the increase in the production and utilization of fodders produced on the farm.

In general it appears more advantageous if not obliged to go too far as regards self-sufficiency in fodders which often results in either that the livestock has to be reduced or else the cultivation of cereals has to be restricted even where forage crops are not profitable in themselves. On the other hand, however, it is also desirable for the farmer to be able to dispose freely of the products of the farm which he requires, and that he only has to surrender to the food supplies authorities those products intended for sale (56).

In Italy, to encourage supplying by means of farm swine production, the Ministerial Decree No. 209 of August 27, 1941 instituted an interesting system of operating in common, the 'allevamento in compartecipazione', fattening contract by which the hog fattener supplies the quantities of feedingstuff required. The hog owner is also considered legally as producer: as such he enjoys the advantages of private slaughtering and at the end, receives half the product in kind. Another interesting form of fattening contract is effected in Hungary in the agreements drawn up between hog producers and large supply centres (communes, towns, important industrial enterprises furnishing food to their staff, etc.). These centres endeavour to obtain foodstuffs on their own account or else with the assistance of the central office; for his part, the hog fattener agrees to place finished hogs at the disposal of the other contracting party. There are also credit facilities so as to make the settling of the matter more advantageous. The contracting party may be either a farmer or an industrial fattener.

In industrial swine production, it is a question of enterprises which are based on the purchase of foodstuffs and are thus independent of farm produced fodders. Naturally, these establishments are appreciably affected by autarchic fodder supplying. They are sometimes considered as out of date forms of exploitation because, in many countries, the purchase of foodstuffs had to be checked by the new agricultural policy. On the other hand, however, these enterprises are of such advantage that they cannot easily be done without. REICHENBACH (65) states even that in Hungary establishments of this type tend rather to increase and that recently an abatement may be observed in the connexion between hog fattening and the farm, because frequently the farm having lean hogs has not the maize to fatten them and that it is not usual to find both on the same farm.

Another problem of rural economy consists in establishing what turn, in war-time, the reciprocal relation between swine production and other branches of animal production may take.

It is not at all easy to solve this problem. In any case an endeavour should be made to produce, with the quantity of feedingstuffs available, the greatest possible amount of meat and fat. In this respect, the fattening of pigs surpasses that of cattle, as, according to UJLAKY-NAGY (66), a fattened hog of 150 kg. may furnish, in the form of meat and fat, the same amount of nutritive principles as a steer of 650 kg. The quantity of nutritive substances obtained from a pig in 1 ½ years require 4 to 4 ½ years to produce in a steer. According to the *Zeitschrift für Schweinezucht* (1941, No. 2, p. 377), the production program of the Association of Flemish agricultural engineers requires that swine production in Belgium be increased because, of all animal species, it is the pig which transforms to the greatest advantage food into meat and which, moreover, is an important source of fat. This program or plan also requires that the number of hogs should be fixed in proportion to the number of dairy cows and the potato crop and that pig fattening should be based on potatoes.

To decide which branches of stockraising should be vigorously supported and protected against excessive slaughtering, there are still other important factors, as, for example: nature of the food required—profitable effect (energy expendi-

ture) thanks to which the respective species of farm stock transform the foodstuff into animal products—the possibility of renewing stock more or less rapidly—labour required—social standpoints, etc.

We have already touched upon the study of several of these questions. It has been mentioned in particular that pigs need foodstuffs which for the most part can be used directly by man, while ruminants elaborate animal products from fodders which without these animals cannot be utilized.

In war-time, an endeavour is made to assure human nutrition by having recourse largely to the direct supply of crop products instead of making a detour through their transformation by livestock, which involves appreciable losses in energy (45). As the forge products on which swine producton is based apart from forage cereals (*viz.*, sugar beets, potatoes, etc.) furnish food also for man, the increase in consumption which results will have for effect a corresponding shortage in pigs. As there is no way of compensating by means of supplementary rations of grain, in the first place, it is necessary to increase, in the feeding of these animals, the use of other products of root crops (mangels, rutaboga,carrots). To this end, it is necessary to restrict the area under mangel-wurzel cultivation serving normally for cattle feeding and compensate the consequent shortage by increased ensilage and hay production. This change, however, is only justified, from the standpoint of public economy, if the pig fully utilizes the nutritive principles of mangels to a much greater extent than ruminants.

Account should also be taken of this fact: in consequence of the shortage of fuel substances, farm work necessitates a far greater number of draught animals than formerly and for military purposes also a large number are required of draught, saddle animals and beasts of burden, which require concentrated feed restricting the quantities available for farm stock.

Mention has already been made of the fact that swine production is exploited more than any other because stock can be renewed relatively rapidly.

In taking into consideration all these points of view, therefore, in time of war some change may be expected in the quantitative proportion between the different farm stock, which would be unfavourable to pigs. REICHENBACH (65) expects a general change in favour of more extensive forms of animal production.

3. Breeding problems

In war-time, it is particularly important to see to a better utilization of the nutritive principles available, consequently it is in no way immaterial to ascertain by what type of swine stock the feed is utilized. What is wanted is the type of hog which makes the fullest utilization of the little it is given (68). Seeing that the more intensive exploitation of stocks leads to a closer selection of the pigs remaining for breeding, attention should be given primarily to continuing breeding only with suitable animals. The short cycle of pig production makes it possible that a relatively rapid effect in selection measures may be attained.

Good and poor utilization of feed are, it is known, hereditary characteristics, so that, in breeding, they will certainly be given greater attention, in the same way as fertility capacity (67). A small hereditarily healthy stock, properly bred,

composed of animals fully utilizing their feed and having a good formation, is certainly more profitable than a large herd composed of heterogeneous individuals. It also goes without saying that attention must be given to good management and proper housing. If it is impossible to eliminate entirely disease and poor output, at least these can be greatly reduced. It is a question primarily of making a better utilization of the diet by improving sanitary conditions and output, in such a way as to economize (26).

The most suitable means of estimating positive yields of hogs consists in following the system of pigs recording, * intended chiefly to give information on increase in live weight from feed consumed—number of pigs for slaughter produced by each sow (losses in young pigs and porklings, frequency in farrowing number of young pigs number of sows, number of boars). In this way, information can be obtained on the relation between consumption of nutritive principles and the process of production, which assists in breeding fertile strains and fully utilizing the foodstuffs available.

In Germany, for example, pig recording has made it possible to establish that, in the two white swine breeds raised, there are strains capable of producing one quintal increase in live weight with a little over 3 quintals ' Getreidewert' (GW) while, in most years recently, 4.2 quintals of GW were necessary to obtain this increase (7). WOERMANN considers that, apart from extreme cases and taking into consideration the possibility furnished by a suitable technique regarding nutrition, in this way, an animal economy of at least 1.5 million tons GW could be effected in the Reich. SCHMIDT (26) even considers that if selection is carried out energetically in the direction indicated, in the usual consumption of concentrated feed in Germany, an economy may be expected of 2.5 to 3 million tons GW corresponding to approximately $^1/_7$ of the total requirement of concentrated feed in the Reich, which amounts to about 20 million tons.

Unfortunately, it is much more difficult to effect pig recording on a wide basis than is the case for milk recording, consequently, it will take much longer to become general.

Recent investigations have shown that breeding and yield capacity are characteristics of type of pig. This is why it has been suggested that they should be determined by type (69).

The composition of the swine stocks of Europe in relation to types results from the marketing conditions of the products fairly changeable in the last twenty years which frequently necessitated a very rapid change in breeding trends: first from the fat hog to the meat hog, then to the bacon type, to return subsequently to the fat hog, etc. There was also a frequent capricious change in the preference given to early development—average earliness—late development. On this latter point, opinion differs even today. Thus the fact that shortage of foodstuffs necessitates speeding up meat production favours earliness. On the

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* In this respect, see the article of Stefan TAUSSIG entitled ' Pig recording in different countries ' — *International Review of Agriculture: Monthly Bulletin of Agricultural Science and Practice*, 1934, Nos. 6 and 7.

other hand, medium earliness and late development have in their favour the same reasons indicated for fattening based on farm products (see p. 64). On the foreground of the question of type the problem often arises as to whether, from the fact that the pig is increasingly being employed for the production of fat besides that of meat (69), it would not be advisable to raise hogs specifically for the fat, that is to say, feeding them up from the first months of their existence (71). SCHMIDT (26) considers that this method of procedure clashes with the large quantity of nutritive principles required per unit increase in weight and with the important differences in the production costs of meat hogs and fat hogs. This is why a high fat production is only possible if its high cost is reduced by the simultaneous formation of meat, that is, if the main fat formation only took place after the meat formation was considerably developed, in brief, if heavy hogs are raised. The possibility has also been studied of obtaining a hog tending particulary to fat production by crossing the Mangalicza breed with the 'Edelschwein' (improved German hog) or the 'veredeltes Landschwein' (improved indigenous hog), a possibility which, it seems, can be realized (72). Another method which can be employed consists in selecting, among the most common breeds, those strains which show a decided tendency to fat production, taking advantage of the fact that even in the young, the capacity for fat production can be from the *body length: thoracic perimeter* value.

A question frequently discussed is adaptation of hog type to available forage basis. According to LÜTHGE (67), the present stocks of sows correspond, as regards type, to pre-war fodder bases, that is, to a more abundant supply of protein feed than that of today. Naturally the existing brood sows should not be eliminated. To meet the requirements of hog producers who wish to have, for fattening with the present food rationing, young pigs either hardier, or of early or late maturing, in Germany a new Ordinance (August 9, 1941) has been emitted regarding the licensing of boars, which Ordinance prescribes, throughout the territory of the Reich, the granting of breeding permits, A or A1, for boars or the improved German breed, the improved indigenous breed and the native breed ('deutsches Weideschwein'). The progeny of these crossings are not used for breeding purposes.

Finally, this question still remains open. In swine production should account be taken, in breeding, of the changes produced by the war years in the feed supply? WINNIGSTEDT (73) considers that by seeking an indirect way applying crossing to a large extent, rather too much of a disturbance would be caused in breeding, and quite probably he is right.

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MISCELLANEOUS INFORMATION

Compulsory crop program for 1941-42 in Belgium

The present conditions of international trade have rendered the supplying of Belgium particularly difficult. The density of the population—the highest in the world—and the relatively small area of cultivable land place Belgian agriculture in a very difficult position. According to the International Yearbook of Agricultural Statistics, on December 31, 1938, the population of Belgium stood at 8,386,553 and the total area of arable land, permanent meadows, pastures and orchards at 1,812,576 ha. This represents per inhabitant a little under 2200 m² on which must be produced practically all the wheat, potatoes, sugar, vegetables, milk and meat necessary for the upkeep of the population. According to the same Yearbook, the agricultural land available per inhabitant would be a little over 3200 m² in the Netherlands and nearly 4300 m² in Germany (former territory, 1937 frontier).

In order to meet the minimum requirements of the population, it was necessary to direct production towards the most indispensable food crops. The *Moniteur belge* of September 20, 1941 published a Decree of the Ministry of Agriculture and Supplies imposing certain crops for the year 1941-42 '.

Article I of the Decree indicates what should be produced on each farm.

In the following table, by cultivable land is intended the total area of the farm to the exclusion of grazed meadows, mown meadows, orchards, greenhouses, nurseries, osier-plots and hop plantations, as also the area under truck and horticultural crops declared in the statistical returns of May 15, 1941.

TABLE

Crops	Total area of farm	Minimum compulsory production, in kg., per ha. of land cultivated in 1940-41					
		Alluvial region	Sandy region of Flanders	Polders	Campine	Condroz	Ardennes Jurassic region Meadow region
Bread cereals	0.5- 5 ha.	1,100	970	1,160	900	860	520
	5-10 »	1,100	970	1,160	900	860	520
	10-20 »	1,100	920	1,160	900	860	520
	20-30 »	1,100	870	1,160	830	860	520
	30-50 »	1,100	820	1,160	740	860	520
	over 50 »	1,100	770	1,160	670	860	520
Potatoes	0.5- 5 ha.	4,300	6,300	4,700	5,600	3,000	4,000
	5-10 »	2,600	5,200	2,900	4,300	1,700	2,800
	10-20 »	2,000	4,800	2,200	3,400	1,200	2,200
	20-30 »	1,700	4,300	1,900	2,500	800	1,900
	30-50 »	1,400	3,500	1,500	1,700	600	1,600
	over 50 »	1,100	1,700	1,200	1,400	400	1,100

Example. — A farm in the alluvial region of 25 ha. comprising 6 ha. of meadows and fruit gardens, has a cultivated area of 19 ha. The bread cereals to be produced (wheat or rye) = 1,100 × 19 = 20,900 kg. Potatoes to be produced: 1,700 × 19 = 32,300 kg.

Average yields. — The Decree calculates the average output per ha. as follows:

Crop	Alluvial region	Sandy region of Flanders	Polders	Campine	Condroz	Ardennes Jurassic region Meadow region
Wheat	2,800	2,500	3,000	2,300	2,500	2,150
Rye	2,600	2,600	2,600	2,200	2,300	2,000
Potatoes	20,000	21,000	22,000	21,000	16,000	16,400

The farmer who does not expect to attain the yields fixed for his farm is *liable to punishment* if he does not sow an area of at least 15 per cent. more than that normally necessary to obtain the production required of him.

In the above example, the farmer must sow to wheat $\frac{20,900}{2,800} = 7.46$ ha., and to potatoes $\frac{32,300}{20,000} = 1.61$ ha. 50 sq. metres. So as not to be liable to any penalty, he has to sow 15 per cent. more land, that is, 8.58 ha. and 1.85 ha. respectively.

The growers who, in 1940-1941, cultivated sugar beets, pulse and/or barley, are required, during the crop year 1941-1942, to plant at least the same area to these crops as in the preceding year.

The same obligation holds good for flax, to the extent of the seed the producers will have available for this purpose. The growers who are required to cultivate pulse or barley (winter barley) may deduct this production from that demanded them for bread cereals. In order not to upset the rotation cycle, a system of equivalents between the different crops has been arranged as indicated in Article 4, reproduced below:

"Without prejudice to obligation laid down in Article 3, it is also permissible for those in charge of farms to substitute one of the compulsory crops listed in Article 1 by another crop, taking into account the following equivalences:

100 kilograms of wheat are equivalent to 100 kilograms of rye (spelt-maslin);

100 kilograms of wheat are equivalent to 100 kilograms of barley (winter barley);

100 kilograms of bread cereals are equivalent to 100 kilograms of pulse;

100 kilograms of bread cereals or pulse are equivalent to 700 kilograms of potatoes;

100 kilograms of bread cereals or pulse are equivalent to 1,000 kilograms of sugar beets;

100 kilograms of patatoes are equivalent to 15 kilograms of bread cereals or pulse;

100 kilograms of potatoes are equivalent to 140 kilograms of sugar beets;

1,000 kilograms of sugar beets are equivalent to 100 kilograms of bread cereals or pulse;

1,000 kilograms of sugar beets are equivalent to 700 kilograms of potatoes".

By another Article, notwithstanding all stipulations to the contrary, the farmers are authorized to plough up their meadows to meet the obligations of the Decree.

Since the publication of this compulsory crop program, various extenuations and adaptations have been made through Circulars of the Secretary General of Agriculture and Supplies, M. DE WINTER.

These aim chiefly at assisting the position of the small farms having no meadowland and that of farms having grown in 1940, a large area to sugar beets and which does not come into the equivalent system.

Therefore, a Resolution of October 18, 1941 reduced the margin of safety which has to be applied to the areas grown to compulsory crops, to 5 and 10 per cent. respectively for farms of 0,5-5 ha. and 5-10 ha.

The Circular of November 25, 1941 lays down that in no case should the area grown to compulsory crops (bread cereals, potatoes, barley, sugar beets, flax, seed legumes) exceed 65 per cent. of the total area including meadows and orchards – of the farm. The Circular also communicates that tobacco crops, vegetable seed and medicinal plants may be deducted from the declared area provided that they were reported in the statistical returns on May 15, 1941. Colza is allowed as an equivalent crop, in the proportion of 70 kg. colza for 100 kg. of bread cereals.

In mixed farms of at least 10 ha., the area grown to vegetables may be deducted from the cultivated area. Legumes (peas and beans) harvested in the green stage for canning factories come into the equivalent system the calculation being 350 kg. of the fresh product per 100 kg. of the dry product. Early potatoes, the yield of which is inferior to that of late potatoes, count in the calculation of equivalences proportionally to the yield obtained on the date on which the grower receives the order to dig up his potatoes. The average normal yield, for example, would be 12,000 kg. on July 1, instead of 20,000 kg. at the normal period of harvesting.

A. H.

BOOK NOTICES *

LODI, Giuseppe. *Piante officinali italiane*. Bologna, Cooperativa Tipografica Azzoguidi, 1941, 613 pp., illustr.

[The chief aim of this publication, of an essentially practical character, is to serve as a guide to herbalists, enabling them to recognize the Italian officinal plants and the drugs obtained therefrom. A large number of these not being included in the Italian official pharmacopoeia, are not treated in the various publications existing in Italy for use in pharmacy schools. The description of the microscopic characteristics of the drugs has not been given so as not to encumber the book with information not necessary in agricultural practice. The part on the medicinal action of drugs has been reduced to a minimum and doses and methods of utilization are not mentioned. The herbalist should endeavour, while remaining within his province, to obtain natural and pure drugs, well prepared and well presented. In the first part, ' The Plant ', the author deals with the different parts of the plant, its classification and composition (poisonous plants). in the second part, ' The Drug ', which is the most important part, the author discusses officinal plants and their cultivation, examining them also from the self-sufficiency standpoint.

The problem of harvesting at the right time, methods of harvesting, cleaning, grading, as well as the preliminary treatment of the material harvested are dealt with in detail in the second part.

After this comes detailed information on the methods of natural and artificial drying of drugs, stabilization, packing, etc.

The author subsequently treats on the examination and preparation of drugs, essential oils, active principles and their medicinal action.

The third part, ' Our Plants and Drugs ' is an accurate systematic enumeration of the plants and drugs and parts for officinal use (shoots, roots, stalks, bark, leaves sap, flowers, fruits, etc.).

* Under this title, reviews are given of books presented to the Library.

Finally the author gives fairly complete information on the officinal plants of Italian East Africa. The appendix covers exotic officinal plants and drugs and Italian officinal plants included in the Italian, French, Swiss and German pharmacopoeias.

This publication, both interesting and useful, is supplemented by numerous illustrations and a detailed bibliography].

G. S.

STURM, Josef. *Die Rodungen in den Forsten um München.* Frankfurt am Main, I. D. Sauerländer's Verlag, 1941, VII u. 152 S., 6 Karten. (Schriftenreihe der Hermann-Göring-Akademie der Deutscher Forstwissenschaft, Band 1).

[In discussing part of the problem of land clearing, the author treats on part of the history of German forests, one of the aspects of the evolution of the life of the peasant. The transformation of the forest into cultivable land and the manner in which this transformation took place, indicate the basis of German agriculture. In this way, an agricultural reader, little concerned with historical information, ends by taking an interest in the subject of forestry].

N. v. G.

VOLKERT, Erik, *Untersuchungen über Grösse und Verteilung des Raumgewichts in Nadelholzstämmen.* Arbeit aus dem Institut für biologische Holzforschung der Universität Göttingen. Frankfurt a. M., I. D., Sauerländer, 1941, 133 S., 64 Abb. und Diagramme. (Schriftenreihe der Hermann-Göring-Akademie der deutschen Forstwirtschaft, Bd. 2).

This book gives some new aspects, on the question of the regular relation between the degree of specific weight and its apportionment in the trunk of the tree. This problem is discussed as regards different species of conifers, the different parts and components of a stand, as well as the state of stands under different conditions. Particular attention is given to the relation between specific weight and the thickness of the annual rings, the results being given diagramatically in curves.

N. v. G.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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OF

AGRICULTURAL SCIENCE AND PRACTICE

THE CINEMA AND WIRELESS APPLIED TO AGRICULTURAL INSTRUCTION IN URUGUAY

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In preparing a plan for the reorganization of its work, the Section for Information and Instruction of the Division of Agronomy came to the conclusion that, if it wished to extend the radius of its activities, its work must be carried out on a wider scale and in a more intensive manner or, in other words, given the means at their disposal and the nature of Uruguayan industries, it would be best to go to the very source of the industries, to the centres where they commence, develop and prosper.

In order to carry out a task of this kind, agricultural institutions similar to ours have instituted ' itinerant chairs ', supplied with all the material needful for instruction. These methods were originally employed by the Uruguayan Central Railway and were continued next by the former Inspectorate of Animal Husbandry and Agriculture, and again by the Supreme Council of Industrial Instruction; they were finally abolished for reasons of economy.

The advantages of these methods of instruction are incalculable. If it is recalled that at that time the radius of action was limited to the areas adjacent to the railway line along which the instruction coach travelled, it will then be possible to imagine the value of teaching groups which would arrive directly at the source of production where producers could assemble to follow practical courses, as has already been done in similar cases, such as mechanical seed selection. In this way producers would come into direct contact with experts who could give them practical advice concerning the best way of operating their farms.

This type of instruction would make it possible to improve and exploit a very large number of agricultural products which are at present lost owing to the mentality of our farmers, the scarcity of means of transport and the system of production which is practised on an extensive scale almost everywhere.

By assisting the regional agricultural expert, the teaching groups organized by the agricultural industries, will offer constant support to his efforts, leading to a better knowledge of the wealth now being wasted and to a better exploitation of the ground. If this form of instruction is to become sufficiently widespread as to attain the above ends, however, it will be necessary to complete oral instruction with cinema displays giving the spectator a clearer idea of what is being done in other parts of the country. The apparatus used must be suit-

able for the projection of slides or illustrations from any book whatsoever, for the recognition, for instance, of plant and animal diseases.

A cinema performance is much more attractive than a lecture and itinerant cinemas draw large audiences; after the performance, the group leader gives the spectators some useful instructions and good advice. Hence the necessity for adding a projecting apparatus to the supplies carried by each group. In this way it will be possible to utilize the apparatus owned by the Section, projecting films prepared in different parts of the country concerning the characteristic features of the different districts, the methods of work employed, the influence of State intervention, and, lastly, it will be possible to alternate instructive films with comic and interesting themes in order to make the performances more amusing.

Broadcasting is one of the more recent inventions which has not yet received any real practical application in the agricultural field and it is well worth studying its application to our groups.

The Uruguayan Ministry for Animal Husbandry and Agriculture, through the medium of Division of Agronomy and the Section for Information and Instruction, has installed broadcasting station C $\times$ 4 for the transmission of countless items of information of special interest to our stockbreeders, agriculturists and farmers, including useful advice concerning some given type of farm work, market prices, weather conditions, etc.

In order to demonstrate the importance of broadcasting in Uruguayan agricultural spheres, the following remarks have been borrowed from an article in a leading newspaper concerning the installation of a continuous information service of this description.

Importance of broadcasting in the country

During the last few centuries no other invention has had such a widespread influence on the economic and social life of our country people as has broadcasting for the rural population. Obvious and tangible proof of this is to be found in the services rendered to the farmer by wireless although but few years have elapsed since its discovery. Broadcasting offers two forms of advantage to our peasants: utility and amusement. As regards the former advantage, they are able to obtain information as to market prices and weather conditions. These are two of the most important factors for the rural population, as they are connected with the production and the sale of agricultural produce.

Moreover, broadcasting affords most efficient help in the solution of problems concerning the employment of labour; during the harvest period, when the demand for labour is at its highest, the farmer can obtain advance information about supply and demand, and about the places where he may apply for the labour he requires.

When an unknown epidemic makes its appearance among the livestock of a country, information can be broadcast to the stockbreeder concerning the measures to be adopted in case of infection, and for fighting the disease until the arrival of a veterinary surgeon from points which are often distant from the farm.

The same may be said in the case of attack by insect pests and all the other troubles which attack horticultural and agricultural crops.

The rural population can also listen in to lectures broadcast by the Universities or the agricultural and animal husbandry schools. Up to the present, however numerous these agricultural schools may be, there is a limit to the number of farmers who can profit by their instruction. It may therefore be said that the wireless will open the door of these schools to many thousands of people living in the most distant parts of the country; moreover all those students who for economic reasons are compelled to interrupt their studies and return to their homes will be able to continue their courses in this way.

A wireless receiving set will be the best investment a farmer can make. His family will thus recover that love for the home which was lost when the large towns attracted the country dwellers living far from the progress of modern science.

It should be recalled that in France a plan has been prepared making an appropriation of 500,000 francs for the installation, operation and purchasing of wireless receiving sets in the agricultural and elementary schools in rural districts, as well as in the town halls or agricultural associations (*Imparcial*, December 8, 1927).

Without looking any further afield, everyone knows what has been accomplished by the Ministry of Agriculture in the Argentine Republic through its daily broadcasts concerning weather conditions and market prices for agricultural products.

Everyone is aware of the serious problem presented by the exodus from the land in every country. Jules MELINE has given a masterly description of this in his book entitled " Retour à la terre ", as has E. EZCURRA in his work " Social matters and rural matters ".

The Uruguayan Division of Agronomy has supplied wireless sets not only to the instruction groups, but also to each regional agricultural expert and this measure may be called ' agro-radio-culture '.

Picture the groups out in the field; after a series of theoretic and practical courses, the radio can be used to listen in to lectures, concerts, etc., advice to farmers' wives on infant management and hygiene, etc.

Would this not be a means of commencing to attach man to the land, teaching him at the same time to increase his production as regards both quality and quantity ?

All modern progress, the railway, the motorcar, the lorry, the gramophone, etc., contributes towards extending to the country the advantages enjoyed by the towns. Of all these inventions, however, the radio offers a much wider variety of amusement, due to the facility with which it can be moved from place to place and to its relatively low cost, which is decreasing still further from day to day. Motorcars, lorries and motorcycles require good roads which cannot always be built in the more distant areas. The cinema calls for a large outlay if it is to bring any profit to those who instal and operate it. The telegraph and telephone require costly installation, and all the other inventions of modern progress could be similarly analysed. Wireless, on the other hand, crosses the ocean and mountains, it is simple and cheap to instal and its possibilities are unlimited. If the radio has in the past five years been a sign of great progress

in the towns, in the country it has indeed been a blessing. It will constitute an attraction for farmers and an even better method of fighting depopulation in the country districts than does the cinema.

The radio has become a common possession among the farmers of the United States. It is considered as being quite as indispensable as dairy and agricultural machinery. The American farmer considers it also as an investment from which he expects some return.

Not long ago a Kansas farmer said: " I had to borrow one hundred dollars from a bank in order to buy my radio. But I was well rewarded for the outlay. It gives me service in a number of ways. My sons, who formerly never wished to stay on the farm, no longer ask to be allowed to leave. We always have breakfast at the hour when information concerning the weather is broadcast, and this helps me in my work. At midday, we listen in to the news about market conditions, and in the evening my children listen in to the college programmes. Since I have up-to-date information concerning prices for cattle, hogs, potatoes and other products, I am able to sell them at the best price. I made a large part of the cost of my radio out of the sale of a single lot of hay, because I had heard the price of hay on the day of the sale ".

In his report to the Encouragement Bureau, U. S. Department of Agriculture, Earl S. MILES, agent for Washington County (Indiana), says that farmers in his area consider the radio as an investment which brings them in profit because it enables them to sell their cattle at a better price.

It is very satisfactory today to see the countryman, living 20 or 30 kilometres from a railway, supplied with a wireless set and a lorry. The wireless keeps him up-to-date with market prices and the lorry enables him to place his products on the market three or four hours after prices reach the level which suits him.

In other agricultural countries, services have been increased to bring them into line with modern requirements.

In Italy, for instance, competitions have been arranged and prizes are given to manufacturers who make receiving sets which are easily used and can be sold at popular prices. Without these essential features the use of wireless cannot be easily spread in the country districts. The powerful broadcasting stations will make it possible for good reception to be obtained throughout Italy and her colonies, even with a small wireless set. Moreover, the Italian Federation of agricultural consortia gives daily broadcasts of news and events of interest to the farmer, market prices for agricultural products, weather bulletins and a practical lesson on some technical subject connected with agriculture.

In this way the farmer knows market prices in time to arrange his sales, while the weather bulletins enable him to take the necessary steps in advance of the weather.

In many countries, even the most progressive farmers are on principle opposed to innovations, but once they are convinced of the advantages to be obtained, they apply the new methods with increasing enthusiasm.

The peasant must of necessity be guided, advised and helped but, owing to distances, it is not always possible to be at his side or to arrive in time

to give him suitable advice. The radio can eliminate this disadvantage since it enables a professor of agriculture to make himself heard in time by thousands of farmers scattered throughout the whole country.

There are still many wireless sets lacking in the country districts, however, although the day is not far distant when every farm, large or small, will have its own radio.

Uruguay, said former Minister PONS, is not an agricultural country like Italy in the sense that it does not produce all the different kinds of crops produced in Italy. Stockbreeding predominates, but this does not mean that other crops are neglected. Thus an increasing interest is being displayed in the intensification of all healthy initiative deserving of attention from the Government, the press and private individuals.

There is no doubt whatsoever that broadcasting is a powerful and very modern method of propaganda as used by statesmen. There are still stronger reasons why it should be used by scientists to circulate scientific information and make it more accessible to the less-favoured classes, especially to rural inhabitants who have had little education but have plenty of good sense and an eminently practical spirit capable of accomplishing much.

The stockbreeding industry is less simple than it would appear at first sight. The most active, up-to-date and practical stockbreeder is the one who keeps in touch day by day with all improvements, since his industry requires knowledge, study and experience.

Broadcasting can give stockbreeders rapid assistance without cost in the care of certain diseases of cattle; it can also help them to avoid these diseases and isolate the animals attacked.

Finally, the radio represents the end of isolation for agriculture. When agriculture has at its disposal all town conveniencies: telephone, motor car, cinema, electricity for both illumination and power, as well as circulating libraries, then the problem of the exodus from the land will be well on the way towards solution; if the rush towards the towns does not completely cease, it will nevertheless be reduced to reasonable proportions.

The Uruguayan Division of Agronomy, through its specialized sections, is planning to introduce into the country all the progress realized in other countries, in order to spread not only knowledge in agricultural affairs but also information concerning social and domestic economy, the prevention of disease, etc. Its aim will always be to render real social service.

All this was well understood by Dr. TOMAS, director of the Argentine social Museum who created a service for the diffusion by wireless of agricultural information and progress, which he considered as an essential service in his work.

In conclusion, we may quote Prof. MERCANTÉ's opinion concerning the services rendered by the cinema and radio: " These two great inventions contribute towards the spread of culture among the masses of the 20th century; by means of pictures the cinema enables them to understand quickly things which are not easily expressed in words; by means of the spoken word, the radio sends out information rapidly to distances of thousands of kilometres, making common knowledge of what was formerly the privilege of a limited number of persons ".

MODERN TRENDS IN FODDER ENSILAGE

Costantino GORINI

In support of the studies which have appeared since 1934, the author shows that modern trends in ensilage have left behind the idealistic and autolytic theory and are now following the realistic microbiological doctrine (1904-1907), according to which silage must lead to lactic fermentation by the essential and necessary means of special lactic ferments for vegetal sugars and possessing effective nitrogenous metabolism, as he forecast in 1920.

Introduction

Ensilage is the process of conservation of fresh forage with the aid of microbic lactic fermentation.

This is the modern trend of ensilage, based on my microbiological doctrine (1904-1907) and replacing the autolytic theory according to which the biochemical transformations in ensilaged fodders must be confined to the vital and enzymatic processes of vegetal forms while all microbic intervention in the silos must be prevented as being parasitic (GIGLIOLI, 1885, H. L. RUSSELL and BABCOCK, 1902, PRATOLONGO and FABRIS, 1939).

SILAGE IS A MICROBIC CULTURE.

The bacteriological research instituted by me has, on the contrary, established the following fundamental principles:

(1) In ensilaged fodders, microbic intervention is practically inevitable.

(2) One may distinguish in their microflora the *noxious* type (aerobic and butyric) and the *beneficial* type (lactic); consequently, according to whichevr type of microflora predominates, there are noxious silages (*putrid* and *butyric*) and beneficial silages (*lactic*), from the twofold viewpoint of animal husbandry and milk production.

(3) Vital antagonism exists between noxious microflora and beneficial microflora; this is why lactic silage is obtained by microbic means:

(*a*) by suffocating the aerobic microflora through the immediate withdrawal of air;

(*b*) by inhibiting the butyric microflora through the creation of an environment capable of guaranteeing the permanent predominance in a brief space of time of the lactic microflora;

(*c*) by inoculating selected ferments.

These fundamental principles, which I defined in 1907 together with the rational rules of anaerobism, temperature and humidity for lactic silage have both permitted and stimulated the diffusion of the practice of ensilage, which until then had been hampered by unfavourable repercussions on the feeding of cattle and on cheesemaking. These principles have, in fact, led to the study

of the microflora of silage (*) and to the working out of numerous ensilage systems, suited to the various qualities of fodder and to different local, seasonal and economic requirements; these systems, if well applied, lead to the production of lactic silage, so that one system does not preclude the use of another, even on one and the same farm. In each case, however, the silages are produced by microbic fermentation, including those which are presumed to be autolytic 'amicrobic' (without microbes).

This is a discussion exactly similar to the one which took place concerning the process of cheese ripening, in order to discover whether this process is due to the natural milk enzymes and rennet or to microrganisms; cut short with discussion which, without excluding the intervention of amicrobic factors, I cut short with the following aphorism: *cheese is a microbic culture.* In the same way I maintain today that *silage is a microbic culture*, without however denying that there is some possible initial part played by the fodder in the process, while the 'amicrobists' (partisans of an amicrobic theory), believe that the whole of the lactic acid is derived from the enzymatic fermentation of vegetal matter exercised on the sugars; they even distinguish between a 'tissular' (of the organic tissues) lactic acid and an inactive microbic lactic acid; on the other hand, certain bacteria are known to produce dextrorotatory and levorotatory lactic acid.

The divergent points of view are due for the most part to insufficient knowledge concerning the physio-enzymology of bacteria. This gap is bridged by a series of works published during the past few years (after the World Dairying Congress held in Rome in 1934) which I intend to discuss in the following pages because, while they corroborate my doctrine, they give a new impulse to the practice of ensilage.

My statement will be developed around two chief points:

(1) universality of lactic microbic ensilage;

(2) inoculation of selected ferments.

I. — Universality of lactic microbic ensilage

In order to obtain autolytic silage, several antimicrobic methods have been adopted which bear witness to an incomprehension of the admirable capacity of resistance possessed by microorganisms to 'dysgenesic' (impeding generation) agents employed in a measure compatible with both the conservation of the

(*) Only after the appearance of my publications did the authors commence to admit the inevitability and an increasing utility of silage microflora (E. J. RUSSELL, 1908; HEINEMANN and HEFFERAN (1909); ESTEN and MASON (1912), HEINZE (1913), NEIDIG (1914), STUTZER (1915), O. W. HUNTER and BUSHNELL (1916-17), SHERMANN (1916), LAMB (1916-17), C. H. HUNTER (1921), SCHEUNERT and SCHLIEBLICH (1926), KAYSER (1927), TRAUTWEIN (1928), KULCHE (1929), BRÉTIGNÈRE (1928), DORNER (1928), RUSCHMANN (1929), CURIN (1932) and several others down to the present time when they have concluded by recognizing their essential and necessary function in the successful production of lactic silage.

vegetal activities under examination and the health of the animals. The sucess of these silages, which have for the most part remained in the experimental stage, is due to the fortunate circumstance that the lactic ferments are, as a rule, more resistant than antagonistic ferments of the putrid and butyric type, so that the latter are generally overcome. The same may be said of the antiseptics invented lately (PRATOLONGO and FABRIS, 1939), in view of the insufficiency of those whose use was attempted previously (HANSEN, 1929, CURIN, 1932).

I have arrived at this conclusion by checking up with three systems which, while accepting the fundamental rules of the microbiological doctrine, were suggested in opposition to this doctrine. Now, they have become widespread because, when well applied, they suppress vegetal activity at the right time and result in microbic lactic fermentation. These three systems are called respectively: 'asphyxial', chemical and thermophilous.

(1) *The 'asphyxial' system* (having recourse to asphyxiation) is based on the antivital action of carbon dioxide emitted by the vegetal matter. There are two objections to this system:

(*a*) Although it is easy to obtain apshyxiation in a bottle-silo or a micro-silo, the same cannot be said of a pit, in spite of the use of ingenious measures for expelling the air and imprisoning the carbon dioxide.

(*b*) Carbon dioxide is neither a sufficient nor a general antiseptic; on the contrary, there are germs which thrive on it. In the 'cremasco' type of silo (SAMARINI's "fieno-silo"), which is the prototype of this system, created in 1916 according to my instructions, and nevertheless quoted as the classical model of autolytic silage, I have always found microbic lactic silages which differed but little from the lactic hays which I have studied (1914).

The same result is obtained today with similar silos called '*cellular*' or '*albese*' (CARBONE, 1938) and 'universal' (GIULIANI, 1936).

The problem has been solved in favour of my doctrine by AMTMANIS's (1937) *Lettonian* silo, where the carbon dioxide is thrust into the mass of fodder under high pressure, in order to expel as much air as possible. In this way a really excellent silage is obtained; this is not due to the fact that it is aseptic, however, but, on the contrary, because it constitutes a perfect lactic silage (containing more than 365 million lactic ferments per gram, as against only 10 butyric ferments). There is therefore favourable co-operation between the carbon dioxide and the lactic ferments.

(2) The *chemical system* is based on the antivital action of acids, and chiefly of mineral acids, added in the strongest possible dose, without, however, harming the health of the cattle, in order to exclude microbic alterations (GIGLIOLI, 1885-1914). But this dose, satisfactorily fixed at a pH of 3.5-4 in the *Finnish silo* (VIRTANEN, 1933-1934), has proved incapable of destroying the lactic ferments, so that today we distinguish two different phases in this type of ensilage: an initial phase of relative asepsis and a final phase of complete microbic lactic fermentation.

On the other hand, in Germany the preference is now to replace the Finnish mixture of hydrochloric acid and sulphuric acid with various composite acids (red and green 'Penthesta', 'Defu', phosphorus oxychloride, 'Carbosil', phosphoryl chloride, etc.), which give less acidity and stimulate the activity of the lactic ferments, especially through the action of phosphoric acid which also increases the nutritive power of fodder and enriches the manure. Herre we have the happy collaboration of the acids with the lactic ferments.

(3) The *pasteurized thermophilous system* is based on the microbicide action of a high temperature produced by overheating a mass of fodder accumulated in the open air (FALAVIGNA, 1937). This is in flat contradiction to anaerobic measures and the thermic limitations which are essential in all systems of ensilage, namely, about 30° C in cold silage in order to stimulate the microthermic lactic ferments, and about 50° C in hot silage to stimulate the megathermic lactic ferments. This is why this system was doomed to failure had recourse not been made to my rules of rationalization (1937-1941), according to which heating must take place rapidly by means of a 'calorigeno' (calefactor) and not through contact with the air but under water, in a water bath, avoiding loss by oxidization and stimulating a sort of cooking, or rather pasteurization at 70-80° C, which leads to the suppression of the microflora and the survival of the thermophilous and thermoresistant lactic ferments (proved by me respectively in 1894 and 1915) capable of guaranteeing a lactic silage (*).

As well as the presumed amicrobic systems numerous others have been evolved called *natural acidification* systems, while there are yet others based merely on some mechanical process (chopping, defibration, grinding, etc.) and on the forcible compression of the fodder, all of which, on the contrary, aim at profiting by the intervention of microbes, always by physiological means. Several systems are identical save that they are called by the name of some place or their promoter, sometimes there is some slight difference in detail. Moreove, harmful confusion sometimes arises regarding the type of construction used for the silos and the technical method of ensilage, upon which the success of the silage depends; this may be excellent even in the open air, while even the best constructions may contain faulty silage (Rome, 1934). The fact is that all these systems call for great skill and much care in the application of both the general and particular rules in each case if it is desired to avoid *non-uniform silages* (*i. e.*, those with butyric zones) as described by me in 1907, since these are dangerous especially for caseation and are found in all systems, from first to last. Nevertheless every precaution and care, even when practising the same system, will not suffice to guarantee uniform lactic silage, inoffensive in caseation. This fact is recognized even by the 'amicrobists'.

(*) Similarly the *electric system* (SCHWEIZER, 1923), owes its success not to the action of sterilization as was originally thought, but to immediate heating at about 50° C., thus suppressing the activity of the vegetal matter and stimulating that of the megathermic lactic ferments.

II. — Inoculation of selected ferments

In order to justify the relentless uncertainty which characterizes all ensilage systems (except perhaps the American system specialized for maize, a fodder which is extraordinarily rich in sugars and lactic ferments), I have attributed partial failures to a insufficiency in quantity or quality in the 'native' lactic ferments present, as a result of which the latter do not succeed in overcoming the butyric ferments in time and in a lasting fashion and in preventing them, as a result of the eventual survival of their spores from a tardy reawakening when they destroy the lactic acid (or the lactates). In order to remedy this it is not sufficient for the lactic ferments to create a disgenesic environment for their opponents, either by means of exhaustion of the sugar aliment, or by a high degree of acidity; their specific antagonistic action, which is probably of an enzymatic nature, must be exercised permanently (Rodenkirchen, 1940), as it is certain that an acidity even higher than the critical degree (pH = 3.2 - 3.5), is insufficient by itself to inhibit the butyric ferments, while, if it is of microbic origin, it suffices even at a lower degree (pH 4-4.4) (Van Beynum and Pette, 1936). In order to remedy the inconstancy of results, I suggested in 1907 that selected ferments should be used, just as I had already done with success in the case of caseation.

I. — The lactic ferments of fodders.

My suggestion, although promptly accepted in several countries (France, Germany, Portugal, Switzerland, America, Belgium), has so far given but few results, because of failure to follow the two directions (perhaps too much in advance of the times) which I formulated as long ago as 1920 on the basis of experiments made on a restricted and on a normal scale, namely:

(*a*) " to select lactic ferments suited to vegetal sugars "

(*b*) " to take account, on the other hand, of their proteolytic properties, in order to obtain simultaneously an advantageous transformation of albuminoids under a more assimilable form ".

I was then announcing, for silage, a kind of ripening similar to that which takes place in cheese.

As regards the 1st direction, the existence of lactic ferments similar to those in milk, although not specialized for lactose but for other sugars (saccharose, maltose, xylose, arabinose, etc.), was neglected until 1936, in which year it began to receive some consideration, and today it is recognized as having fundamental importance in the microflora of silage. In this connection, the works of the following authors should be consulted: Allen, Harrison, Watson and Fergusson, van Beynum and Pette, Virtanen, Cunningham and Smith (1936-1937), Pederson (1936-1939), Arnaudi (*) and Politi (1938-1939). Politi (1940).

(*) Arnaudi is mistaken in attributing to himself priority in pointing out the specialized lactic ferments of vegetal matter as agents in the conservative acidification of ensilaged fodders (*Monthly Bulletin of Agricultural Science and Practice, International Institute of Agriculture*, Rome, 1940, Year XXXI, No. 11).

The forms which have received most study are the bacillary forms, asporogenes grouped under the modern name of *Lactobacillus plantarum*, which includes several enzymatic varieties (*Lb. pentosus*, *Lb. arabinosus*, *Lb. pentoaceticus*, etc.). But there are also coccus forms, grouped under the name of *Lactococcus plantarum*, including the diplococci (*Enterococcus*), the tetracocci (*Pediococcus*) and the streptococci (*Leuconostoc* PEDERSON 1939, POLITI 1940), which also offer enzymatic varieties. These are ambient variants resulting from environment, in my opinion (accepted by the most outstanding enzymologists), allowing that the ensymes belonging to a given microbe are all permanent and, constitutional, but that they may be distinguished quantitatively into *habitual* enzymes and *adaptive* enzymes, according to whether they manifest themselves independently or not of the substratum. We know, for instance, lactic ferments which, from the hexoses, only form lactic acid, while from the pentoses they also form acetic acid (SCURTI), another acid which is useful in silage, which the autolytic doctrine would attribute to a division of the acetys (pectins, lignin) in fodder (PRATOLONGO and FABRIS, 1939).

There are also ambient varieties which are microtherm and megatherm in relation to the optimum temperature of development; on the other hand, lactic ferments are, generally speaking, capable of resisting heat, so that they are also found in thermophile silage. I have, moreover, found real thermophiles compulsory or optional sporogens (*B. lactis thermophilus* Gor. 1894 – *B. acidificans presamigenes* Gor. 1904), a fact which has been confirmed by several authors (SCHEUNERT and SCHIEBLICH, 1926, DEMETER, 1930, ALLEN and WATSON, 1937, etc.).

The 2nd direction, concerning the advantageous transformation of albuminoids, is still almost unknown, and yet proteolytic activity is fairly frequent in silage microflora, as I demonstrated long ago in *B. acidificans presamigenes* (1904) and variations of the *Enterococcus* (1923-1926). Now research carried out in America (BERGER, JOHNSON and PETERSON, 1938), has made it possible to identify variants of *Lb. plantarum* (*Lb. pentosus*) and *Leuconostoc* which elaborate acidopeptidases (but not acidoproteinases) similar to those which GORBACH discovered in 1936-1937 in my acidoproteolytic cocci. These activities lead to the demolition of proteins limited to the peptones and aminoacids, which is also desirable in the autolytic silages made either with or without the aid of acids. In this way, the protein value of fodders remains essentially unaltered or is even increased (REETZ, 1928, BROUWER and DE RUYTER, 1925, WATSON and FERGUSSON, 1938, PRATOLONGO, 1939) and their digestibility is facilitated, thus adding another advantage to ensilage. This predigestion (CUNNINGHAM and SMITH, 1939) should be clearly distinguished from the deleterious, destructive and even toxic action of the antagonistic butyric microbes (they also are acidifying but with a much lower acid power) and alkaline-proteolytic or putrifying.

A fact which adds value to the specialized ferments of vegetal matter is that variants of the *Enterococcus* and the *Lb. plantarum* (*B. acetylcholini* Keil 1935, in which Dr. Luigi GORINI found acidopeptidases) have been discovered in Germany (Heidelberg); these produce acetylcholin, an aminobiogene the

mechanism of whose formation has not yet been clearly defined, but which in any case derives from a metabolic process offering a new proof of the importance of the nitrogen exchange in lactic ferments.

All that is known about lactic microflora must be used for inoculation. GOLDING, DECOUX and PIRAUX (1934), ARNAUDI and POLITI (1938) have already used lactic ferments obtained from vegetal matter in preference to those obtained from milk (utilized on the other hand by ALLEN and WATSON in 1934), but without considering their nitrogen exchange. On the other hand, the mere sowing of the microbes does not suffice; as I have already taught in connection with caseation a suitable environment for their development and activity must also be created. In order to create this environment, it is useful to add substances capable of helping the lactic ferments in their fight against their opponents, such substances are molasses and kitchen salt (which I recommended in 1919) or the vitamin food and growth factors brought into prominence by modern research work, or else they may be brought into association with other synergic germs as suggested by myself and GOLDING, L. A. ALLEN and S. J. WATSON, PIRAUX (1934).

The Heidelberg School is now developing the complete experimental study of this matter in order to utilize *B. acetylcholini*, which is considered as a specific factor in the acidification of vegetables (pickled cabbage, cucumbers in vinegar, etc.). This School, whose staff includes botanists, chemists and bacteriologists (EICHHOLTZ, BREHM, KEIL, KRITTER, MÖLLER, HABS, etc.), bases its work on the principle that "the biochemical process of preserved vegetal matter must commence with *the rapid death of the tissues* in order to attain, in a brief space of time, an energetic microbic lactic fermentation capable of overcoming the harmful microflora". This is undoubtedly an absolute microbiological doctrine. A search is now being made for the most suitable conditions so that *B. acetylcholini* may, alone or in symbiosis with other microbes, produce a lactic fermentation which is practically pure and very beneficial, both as regards preserved vegetables and fruits as well as silages in order to extend its advantages from the feeding of animals to the human diet.

2. — LACTIC FERMENTS OBTAINED FROM MILK.

Following a different line, but still adopting the microbiological trend as definitely opposed to the chemical trend, another type of study is in course of examination in the Netherlands and Germany concerning the use of whey in ensilage, especially in the case of young forage rich in protein (BROUWER, 1937). These studies, suggested by the importance falsely attributed so far to lactic ferments obtained from milk, appeared doomed to failure after the discouraging results obtained in Germany (GERLACH and GUNTHER, KIRSCH, 1935), and in England (ALLEN, WATSON and FERGUSSON, 1937). Today, however, they have been renewed from a new and promising standpoint, namely, with the aim, not of inoculating ferments obtained from milk, but of adding a strong dose of lactose to the fodders in order to stimulate the lactosic ferments (always present in fodders) to co-operate with specified vegetal ferments so that the required acidi-

fication is reached more quickly. With this end in view it is suggested to use liquid whey in large quantities (25 per cent. according to VAN BEYNUM and PETTE, 1940) or else powdered whey (2 to 3 per cent. according to RUSCHMANN and BARTRAM, 1941). The addition of liquid whey would also have the advantage of immediately expelling the air from the mass of fodder; powdered whey, on the other hand, offers the advantage of a lower microbe content while, at the same time, it does not damp the fodder; either would increase the food value of the silage; but neither is exempt from the disadvantage of introducing to the silage unknown and inconstant microflora, which might even be undesirable, and capable of hindering rather than stimulating lactic fermentation; indeed, RUSCHMANN's conclusions concerning the influence that the bacteria content of whey, which is variable in relation to the process of desiccation adopted, may exercise on the course of lactic fermentation, are not devoid of uncertainties. It may be added that this course of fermentation may be affected by the various elements composing the whey, including the protein substances which act as a buffer.

In order to avoid these complications, one may ask if it would not be more reassuring (if not cheaper), to stimulate milk ferments by the addition of lactose, just as molasses is added to stimulate vegetal ferments. On the other hand, if the intention is to use inoculation as a basis, lactic ferments might be associated with vegetal ferments, as has been done by GOLDING (1934) and PIRAUX (1934), by inoculating cultures of *Lb. casei* and *Lb. plantarum* (*) as well as of *Streptococcus lacticus* and *B. cucumeris fermentati* (type *Lb. plantarum*). This process would also give silage a valuable addition of caseous ferments.

3. — ENSILAGE WITH MOLASSES.

In England recently (WATSON, FERGUSSON, 1937 and 1938), as also in America (BENDER, HEGSTEDT, HUFFMANN, 1939), ensilage with the addition of molasses (from 1 to 4 per cent.) has made great progress. This method is preferred to ensilage with acids, which is considered as less practical and less sure; it is also preferred to ensilage ' asphyxial ', which is considered as better suited to wilted than to fresh fodders and is used for the purpose of obtaining a stronger concentration of carbon dioxide.

Ensilage with molasses, which moreover increases the nutritive value of the fodder, is also based on the microbiological doctrine. Indeed, molasses preserves the proteins by means of two mechanisms of the microbiological type: (1) as an excellent source of energy for the microbes, it prevents them from

(*) TRACY (1938), however, has proved that this is not a case of two different species since *Lb. plantarum* can produce *Lb. casei* by dissociation and *vice versa*. This shows the advantage of classifying lactic ferments on a biological rather than a chemical basis, *i. e.*, on an enzymatic biochemical basis, as I suggested fifty years ago (1892).

utilizing the proteins for this purpose, as these latter should be used only as nourishment for the synthesis of the plasma; (2) as a stimulant for the lactic ferments, they accelerate the acidification necessary for hindering the proteolytic action of undesirable microflora. It must not be forgotten, however, that, on the other hand, molasses is also very good for the development of this microflora so that it may lead, on the contrary, to a dangerous delay in acidification if the activity of the lactic microflora is relatively slow and faulty. This explains the insistence with which, while sympathising with the method of ensilage with molasses, a warning is given that the useful purpose of sugars is strictly subordinate to the essential conditions for the rapid predominance of lactic ferments; otherwise, it is stated, all additions of sugar (molasses, sorghum, maize flour, etc.), may be foregone and indeed it is better to do so. This constitutes, in my opinion, a very valid argument in favour of the association of molasses with selected ferments, instead of the unsuccessful suggestion of associating molasses with acids (' Defu ', BRUMMER, 1940). In this connection I would recall that, at the International Congress of Microbiology held in London (1936), I suggested that acids should be associated with the inoculation of acid-resistant lactic ferments, which appears to me to be more rational.

4. — CONSEQUENCES IN CONNECTION WITH THE DAIRYING INDUSTRY.

In any case, when modifying silage flora, the caseation aspect of the question should not be lost sight of, as it is the most delicate and, at least in the dairying regions, the most important part of the question. In this connection, I have described two series of facts which also belong to my doctrine; one illustrated in 1909, is now a commonly accepted fact; the other, in 1927, is on the point of being accepted.

(*a*) The former of these series of facts indicates, as a cause of the effects of silage on caseation, the direct and indirect contamination of milk resulting from the microflora of silage; these effects may even be observed in the same stable when ensilaged fodder is fed only to the non-milk-producing animals.

(*b*) the latter series of facts indicates, as another cause of these effects the influence of the cows' diet on the fermentative aptitude of the milk; a badly fermented silage may thus cause the production of milk which I have called *dysgenesic* because, although it appears normal as regards organoleptic features and results of the usual analysis, it is unsuitable for the culture of cheese ferments, probably owing to constitutional and enzymatic modifications, followed by a shortage of elements quantitatively accessory but qualitatively essential to the typical activity of the germs (nitrogenous aliments even if non-proteinic; salts of lime and phosphates; vitamin and growth factors, etc.).

Various authors are carrying out research work in connection with this second series of facts (GRIMMER, 1938; PRATOLONGO, 1939; KURSTEINER, 1940; PARISI, 1940; POLITI, 1941). It is certain that since the ascertaining of dysgenesic milk (which corresponds to what cheesemakers call *weak milk*) (1935), account must be taken of this factor both to limit the quantitative and qualita-

tive use of the various silages in feeding dairy cattle and to effect the necessary alterations in cheesemaking technique.

This is how the microbiological doctrine, after elucidating the basic problem of the nature and discipline of the fermentative process and the internal mechanism of acidification for the conservation of silage, leads the way to the solution of the accessory problems, by showing that they must be approached through the collaboration of several competent persons.

III. — Summary

The modern trend of ensilage confirms and widens the scope of my *microbiological doctrine*, which differs from the autolytic theory, contrary to any microbic intervention whatsoever in ensilage, by asserting that this intervention is inevitable in practice and that it should rather be stimulated and utilized, duly regulated so as to produce lactic fermentation, so useful from every point of vie.

My doctrine has permitted and stimulated the spread of the practice of ensilage, formerly hampered by the unfavourable effects of silage on the feeding of the animals and on cheesemaking; it has also permitted and encouraged the creation of various systems of ensilage suited to the different qualities of fodder and different local, seasonal and economic conditions. All systems, however, including those considered as amicrobic, are successful when they produce lactic silage, by following my rational rules formulated on the basis of physiology and bacterial enzymology for the purpose of helping the lactic ferments to overcome antagonistic and harmful ferments in time and permanently. Thus one system does not exclude another, even on the same farm.

In any case, the perfect application of these rules encounters insurmountable difficulties which make the use of every type of silo and every system of ensilage more or less hazardous, so that, in spite of every precaution and care, as a general rule, non-uniform silages are obtained. These are dangerous, particularly to the dairying industry, not only owing to the microbic contamination of the milk, but also because the milk obtained is unsuitable for fermentation in cheesemaking, as demonstrated by my research in connection with *dysgenesic milk;* this also is an accepted fact today.

In order to overcome the difficulties, I have suggested the *use of selected ferments:* but my initiative has so far given but few results, *because my instructions have not been followed concerning the use of special lactic ferments for vegetal sugars and exercising, besides, useful action in the nitrogen exchange,* in order to obtain other alimentary advantages from ensilaged fodders. Basic importance in the microflora of silage is now attributed to these specific ferments which were formerly misunderstood, although an accessory part is reserved to milk ferments in connection with cheesemaking.

Studies now being made in various countries, which abandon vain autolytic aspirations and utilize to the full my positive doctrine, open up the prospect of real progress in the ensilage of fodders.

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IMPROVEMENTS IN RURAL BUILDING

H. J. HOPFEN

The development of the organization of work and the use of machinery in agriculture, the building possibilities of new materials, the more complete knowledge of soil and climatic conditions, the requirements of air defense, as well as social development, all place rural construction in front of new problems, the solution of which can no longer be found in the traditional types of building. In this article the possibilities of developing rural construction are examined in relation to the following questions: disposal of the different rooms—arrangement of the buildings—their height—roof structure—structure of walls and ceilings— choice of building material—interior installations.

Introductory

In several previous articles published in the *Monthly Bulletin of Agricultural Science and Practice* (1940, No. 1, Nos. 7-8; 1941, No. 2, No. 10), attention was called to the innovations regarding rural construction frequently returning to these two questions: (1) The influence of modern technical installations on the structure of farm buildings—(2) The construction of healthy buildings conditioned by the masonry. In this article it is proposed to develop the same ideas taking into account the influence the present war may exert on rural construction.

The very rapid evolution of agriculture during the 19th century confronted rural construction with new problems which can only be solved by degrees. This purely technical evolution in agriculture necessarily led to forms of construction which had no counterpart in the past. The old forms of constructions, suitable for another type of farm management, today often restrict the possibilities of developing a farm according to modern concepts. Firstly they lack the faculty of enabling an appreciable saving in time and labour because, at the time when they originated, the question of labour shortage did not exist. It is chiefly in the interior management of the farm and of the household where the shortage of personnel is felt, that too marked an attachment to the old traditions of earthen construction particularly checks progress.

The shortage of labour necessitates turning more to technical measures the growing use of which ends in reducing and simplifying work methods. The obligation to utilize as much as possible th existing machinery and technical installations leads to greater uniformity in the working of the soil in regions having the same climate, and to the establishment of a wider basis to realize greater unity in construction, so that for such regions in time there is no longer any reason for continuing diversity in type in rural building.

In a well conceived project from the standpoint of organization of work and the use of machinery, the type of construction should be the outcome of the realization of the purpose of the farm. Moreover, in drawing up the building plan, account should be taken of the constructing qualities of the materials em-

ployed, soil and climatic conditions, air defense requirements, as well as social development. The meeting of one of these requirements frequently prevents that of another, so that with so many exigencies, it is not easy to find the best solution in each case. The questions which have recently started to be discussed in this respect chiefly regard: (1) The reciprocal disposal of the different quarters — (2) Arrangement of the buildings — (3) Height of these and number of floors — (4) Roof structure — (5) Structure of walls, partitions and ceilings — (6) Choice of building material — (7) Interior installations.

1. — Reciprocal disposal of the different quarters

At present considerable attention is being given to this question in order to ascertain what is the most practical arrangement from the standpoint of organization of work. As the execution of the different operations inside the farm depends greatly on the transport of more or less bulky products to and from between the places where they are obtained, where they are stored and where they are consumed, studies on this question aim essentially at abbreviating the distance covered in transporting work and at finding some means of effecting it mechanically in the case of large loads shifted at a time. In this respect, the form of the building is particularly influenced by the development of modern elevators, which facilitate enormously the vertical transport of products in bulk and thus the storage of supplies immediately above the place where they are consumed, which system is desirable from the viewpoint of organized work.

The studies in question also regard the shortening of the distances which have to be covered by those working inside the farm. In the arrangement of the different quarters, it is important to identify those centres where the different work operations start and end. In the peasant farm where most of the inside work is incumbent on the farmer's wife, the kitchen represents the work centre, so that the other quarters should be coordinated with it in such a way that those which have to be used the most frequently are the nearest. On larger farms, in proportion as the work becomes more specialized, several work centres will be formed, which will thus give rise to several groupings of quarters more or less independent of each other. According as the size of the farm increases, there will be a decentralization of the various farm operations, accompanied by a more marked specialization in each. Jointly with the tendency to simplify the type of farming resulting from a greater technical penetration, this evolution finally leads to a form of soil utilization in common turning increasingly to specialized individual work limited to the use of certain special machines or technical installations. The consequences of such an evolution for farm buildings are still too remote to be discussed here.

2. — Arrangement of the buildings

Distinction is usually made between the system which combines several buildings under one roof and that in which the buildings are separate and independent of each other. The question of determining whether one or the other

of these systems, or else some transition form, is that which is suitable in each case, depends on climatic conditions, the size of the farm and other factors inherent to the merits and disadvantages of each system.

The advantages of combining the buildings under one roof are: (1) primarily a reduction in the distances to be covered and, in the case of bad weather, protection of the means of access to the different working quarters in the interior of the farm; (2) an improved thermal insulation of the different quarters.

The advantages of separate buildings are: (1) primarily reduced risk in the case of fire or epidemics — (2) greater freedom of movement about the different buildings — (3) greater licence in the case of changes in method of farming necessitating modification of the buildings. In general, it is less expensive to construct buildings separately than combined under one roof, as the construction of each separately is more simple and the material employed, in part, is cheaper.

The combination of the dwelling house, the stables and barns and the storerooms under one roof is particularly justified in regions with harsh winters, while it is not practised in warm regions where there is a great necessity for fresh air for many hours if only to remove, as far as possible, the disadvantage of smells and insects inherent to the increase in heat.

The experience acquired in air defense is another factor in favour of separate buildings, as it has been found that the most effective air defense consists in reducing losses as much as possible by spacing out the different buildings and making them inconspicuous. Their arrangement about an open courtyard, such as is adopted in many countries, well meets the requirements of air defense; it is advisable to complete the form of the courtyard by planting trees or shrubs at intervals between the buildings.

On the other hand, the spacing of the buildings has the disadvantage of lengthening the distances to be covered in carrying out the different operations and necessitates going from one building to another in the open, which can be unpleasant in bad weather. It would be possible to make a sheltered passage between the main building and the accessory buildings establishing under the first an air raid shelter with subterranean passages leading to the other buildings and capable, if necessary, of also serving as means of egress. Such construction, however, may increase the cost beyond the limit tolerable.

For reasons of air defense, closed courtyards are given little preference now, while no exception can be taken to them as regards the organized working of the farm, as means of sheltered internal communication between the different work centres can be established. Moreover, if the closed farmyards of farm buildings are spacious, the reasons invoked for air defense are less valid as they do not present as much danger as the narrow courtyards of the tall groups of urban houses on a restricted base where explosions can cause much greater damage to the surrounding walls.

For the farm, the building plan rarely comprises the courtyard as such, although it constitutes a very expressive architectonic motif when its size harmonizes well with the height of the surrounding buildings: the height should be rather low while the courtyard should be sufficiently large to allow of the plant-

ing of fruit trees with flowerbeds and green sward, eventually even the cultivation of vegetables and, besides, a border path in order to assure sufficient freedom of work near the buildings. The courtyard, however, should not be too large for its protection against wind to be endangered. Manure should not be kept in the yard: it is better to keep it away from the buildings or else in special manure stalls.

The small rectangular courts of the houses in the Mediterranean regions and in Central America, that is to say, the Spanish patios of Arab origin, denote, in their hermetical closing on the outside and in the alignment of all the rooms on the inner court, not only the need for security but also a profound understanding of the best protection against the solar rays in an environment having little rain and vegetation, and where at night the temperature often drops considerably. The direction WE or better NW-SE, of the longitudinal axis of these courts shows that an endeavour is made to avoid as far as possible the incidence of the sun's rays in the interior. The whitewash on the roof and the outside windowless walls checks the absorption of these rays, while the warm colour of the inside rooms and also the plants and grass which adorn the courtyard counteract the unpleasant reflections of the solar rays which penetrate to the court and, at the same time, procure a natural renewal of the air while preventing too sudden a drop in temperature during the night.

In general, the aim in arranging the buildings is to combat the effects of extreme climatic conditions. Thus in the regions with appreciable seasonal or daily variations in temperature, an endeavour is made to attenuate the effect of their extent by combining the buildings under one roof. On the other hand, in very windy regions, the buildings are arranged in such a way that they present as little surface to the wind as possible, which effect is obtained either by choosing sheltered sites or orientating the buildings, in length, according to the direction of the predominating winds, or else by establishing windbreaks. On the other hand, in the regions where the atmosphere is constantly hot and moist, the possibility of adequate ventilation must be assured in order to prevent the formation of mould in the houses; this is obtained (also to facilitate living conditions for man) by arranging the main surfaces of the buildings across the prevailing winds. In building plans increasing attention is being given to the planting of tree or shrub stands, since the simplicity and value of such auxiliary means have been recognized.

3. — Height of buildings and number of floors

The development of modern elevators makes it possible, in proportion as the size of the farm increases, to meet the growing need of quarters by increasing the number of storeys on a relatively limited base. In some regions with a particularly harsh climate, such tall-storeyed buildings have already been constructed; this system, however, necessitates a well determined organization of the farm which, on its side, fixes the details of the building and thus makes it difficult to effect any eventual changes, if the farm is modified, or even in the case of a subsequent enlargement. In the case of tall buildings combined

under one roof, the building plan necessitates a greater reciprocal combination of the different quarters and technical installations than in the case of spaced out buildings and, consequently, a closer adaptation to the stage of development attained at the time of building which thus reduces the possibilities of further improvements. Moreover, for economic reasons, tall buildings are not suitable in farming as they are only admissible where building sites, being limited, are dearer, and thus augment buildings costs to the extent of counterbalancing the increase in expenditure brought about by each additional floor necessitating the reinforcing of the foundations and the transporting of the material constantly to greater heights. On the other hand, air defense measures are opposed to any kind of too conspicuous building.

Compared with several-storeyed edifices, simple one-storey buildings have many advantages, *viz.:* possibility of employing appropriate and cheap building material—elimination of complicated foundations—facility of transporting the building materials at hand—abolition of flooring and stairs. On the other hand, they require a greater roof area, offer less protection against cold and heat than several-storeyed buildings in regions with more or less considerable variations in temperature and are not so suitable as regards proper planning of the farm work. In many countries, particularly tropical countries, the annoyance caused by insects is much greater within a short distance from the ground than higher up, so that preference is frequently given to dwelling houses having an upper storey. On the farm, even today, the buildings generally have one floor (besides the ground floor) which are the most suitable. In this case, the different buildings should have, as far as possible, the same height throughout, in order to ensure uninterrupted ridge roof lines, as variation in height not only spoils the general aspect, but also increases the building cost and upkeep expenses.

4. — Roof structure

A good roof should not only protect the building against the inclemencies of the weather, but also contribute towards maintaining the inhabitants in good health and stores in good condition. Therefore, it should prevent humidity penetrating into the interior, at the same time let all exhalations formed come out and also assure thermic insulation. This is particularly important in rural buildings where there are living beings which breathe and stores and provisions which emit exhalations. For this reason, on the farm soft roofs of thatch, reeds, leaves, etc. are better for the health than hard roofs in tiles, etc., and even massive roofs. In this respect, thatch roofs are particularly suitable, as they allow the exhalations to pass through the thatch and also effect thermal insulation. These advantages, to which is added the low cost, however, are questioned by the combustibility of thatched roofs. These also have the disadvantage of deteriorating easily under the action of wind and of offering shelter to all kinds of vermin. Consequently, despite its advantages, thatch has been increasingly replaced by tiles, even on the farm. Recently, however, an attempt has been made to reduce the combustibility of thatch by mixing it with clay or else soaking it in certain chemical products, so that roofs of marled thatch

could be adopted at least for modest rural buildings. Moreover, an ever increasing need is being felt for fire-proof roofs containing no timber-work, particularly in more or less dense agglomerations, in consequence of air warfare and the increasing shortage of wood in many countries. Now, the roof built of ordinary tiles no longer meets this need, all the more so in that it rests on a wooden framework. Also wood is becoming increasingly important as a raw material for industrial purposes, which thus restricts its use in building. Mention should be made of the growing damage caused to timber-work by the dry rot fungus (*Merulius lacrymans*) and by insect pests, especially under roofs where proper ventilation about the wooden blocks has been neglected. All these difficulties intensify the tendency to substitute other materials for wood in roof construction.

In this respect, the experiments carried out with steel-wire concrete beams and hollow brick beams are very interesting. The first mentioned are manufactured according to a patented process, the principle of which is as follows: steel wires stretched to two extremities are covered with concrete in suitable moulds, then, after the concrete has hardened, the two ends are cut, so that they show a tendency to contract slightly, which gives the beam thus formed a special resistance. The construction of simple frameworks with these steel-wire concrete beams has given good results.

As regards hollow brick beams, they are made in the work-yard as follows: special hollow bricks having 3 grooves on the under side are assembled end to end with the flat side underneath; 3 relatively thin iron rods are placed along these grooves and bent back at the two ends; cement is poured over these rods and also where the bricks join. After the cement has set, these beams are placed side by side to form the ceiling; recently, however, they have also begun to be utilized in the construction of massive roofs by fixing them on a median concrete beam which is propped on a flooring or supporting wall.

The structure of massive roofs tends to exclude the use of wood for the framework already for the fact that ventilation is more difficult. In Germany, an attempt has recently been made to construct, according to a new process, inclined massive roofs in which all framework is eliminated; no definite opinion, however, can as yet be given on their value. It is probable that these inclined roofs exert a strong lateral pressure on the external longitudinal walls.

A strengthening compact closing of the ensemble of the walls can only be realized by a completely horizontal terrace roof, easier to construct than the inclined massive roof and having an unlimited duration if well built (but only in this case), without occasioning any expense for upkeep. With average distances between the supports, the terrace roof possesses a considerable load capacity without costing more to construct than the ordinary inclined roof. Consequently, the natural form of the massive roof seems to be not inclined but terrace-like, despite all objections to the contrary.

In organized farm work, the horizontal roof has an appreciable importance because, jointly with the use of an elevator, it can be most useful in the drying of different farm products. It is known, in fact, that the surfaces which reflect the calorific rays exert a strong drying action and thus the desiccation of ce-

reals leaving the combines can conveniently be effected. Even for the accelerated drying of green forage rich in nutritive principles, the more or less extensive surfaces of terrace roofs would be important as experiments (made in Switzerland) on the natural drying of grass on level concrete surfaces gave surprising results as regards the quickness of drying and the quality of the product obtained, which was not in any way inferior to the green fodders dried artificially.

The horizontal roof, however, has a disadvantage which is shared by all massive roofs, particularly for the farm: there is no chance of a natural evacuation of the exhalations; this defect can be remedied to a certain extent by installing ventilation devices.

5. — Structure of walls, partitions and ceilings

The chief object of a building intended to shelter living beings or to protect stores and provisions consists primarily in assuring healthy conditions, that is, not only in eliminating unfavourable weather effects, but particularly in assuring an appropriate room atmosphere by meeting ventilation and light requirements as well as an opportune regulation of temperature and humidity. To attain this object, ordinarily supplementary contrivances and installations must be more or less extensively employed, their intricacy or simplicity depending not only on climatic conditions, but also on the properties and the structure of the walls, partitions and ceilings.

The constitution of walls, which will be dealt with further in the subsequent chapter, is the outcome of the different properties of the building material employed, among which thermal insultation and resistance to humidity are the most important from the standpoint of room atmosphere.

The thermic insulation of a wall affects the heating expenses of a house considerably; it is decisive as regards the working of ventilation devices and chimneys, and also as to whether the formation of condensation water takes place or not in rooms where the air is saturated with vapour. Frequently, the use of certain devices inside the building could be reduced if greater attention was given to the thermic insulation of the outside walls.

In a building material, the thermic insultation is inversely proportional to its chief building property, which is resistance to pressure. A thermo-insulating material is generally porous and, consequently, having little resistance to pressure. A pressure-resistant material is usually compact and is not thermo-insulating. This certainly is one of the reasons why, up to the present, the thermo-insulating properties of walls in relation to their load capacity have not been taken into consideration.

In the future, wall structure will probably develop increasingly towards the use of building materials which will allow the development of some specific properties. With one material, the development of specific properties can only be made at the expense of other qualities (as is manifested particularly in the relations between resistance to pressure and thermic insulation). On other hand, different materials with different specific properties may, even if employed in

smaller quantities, exert a general combined effect better than that obtained with the use of one material only in which the different properties cannot be united according to the proportion desired. Consequently, evolution tends decidedly towards a wall structure having two or three vertical parallel layers of which each only realizes certain specific properties in the most suitable form.

The most appropriate form of constructional elements aiming solely at solidity is not the supporting wall but the framework. This is why walls can be exempted from all supporting effort and thus be better assigned to other functions. In this way it is possible to separate the constructional elements constituting the walls from those which confer solidity and to construct walls by combining the use of frames with that of different vertical layers.

In such a building process, the framework and ceilings constitute a coherent group which should only be constructed by specialized enterprises. The subsequent construction of the walls can be effected separately from that of the frames and the ceilings and can be carried out by the local builders with local material. In this respect, it should be mentioned that the parts of the framework should not be united to the walls unless measures are taken as regards their thermic insulation. Walls could be constructed most simply and rapidly by employing processes with which the outer layer, impermeable to humidity, can be made in concrete projected on a metal truss, then applying on it the inner thermo-insulating layer formed of porous concrete. Unfortunately as yet there are no tried methods of preparing porous concrete on the spot.

6. — Choice of bulding material

The more appropriate a material the greater the economy in its use, which makes for reduced transport expenses and less dependence on local materials.

Reinforced concrete is excellent for the construction of frameworks. The parts of the construction subjected to bending stress, however, require a considerable proportion of iron. If an ordinary beam in reinforced concrete sustains a flexure, the lower part is subjected to tensile stress which is borne by the iron. When the iron sustains too heavy a load fissures occur in the concrete which may lead to the separation of the two components of the iron-concrete complex. Although concrete can sustain heavy pressure, on the other hand, it shows relatively little resistance to tensile stress. This fact suggested to M. FREYSSINET, well known French constructor, the idea of maintaining the constructional elements in concrete under constant pressure, in order to prevent tensile stress occurring. This concept may be realized in two ways: (1) by encompassing the concrete with steel wires first stretched (see p. 115) which, subsequently released from the tensile devices after the hardening of the concrete, exercise on this latter a constant pressure called ' precompressure ' — (2) by stretching after finishing when the steel wires are already inside the block but not allowed to adhere to the concrete during hardening; this putting in subsequent tension of the steel wires firmly attached at one extremity, with the fixation of the tension at the other end, also exerts a constant pressure on the concrete, but is more difficult to realize than the preliminary tension of the said wires producing

the precompressure. These wires may also be put into tension after finishing, on the outside of the material to be 'compressed'; this operation may be compared to a sort of tying up. 'Compressure' after finishing is required when the building elements have to be constructed on the spot and when there are no buttresses available for the tension of the steel wire outside the constructional elements, which makes it necessary to look for them on the elements themselves.

'Precompressure' is very important not only in the case of concrete but also of any other building material which resists pressure. The combination of two materials which can be subjected, one to pressure, the other to tension, into one compound material which combines the advantages of each component, opens up new possibilities in the building art, which up to the present were unsuspected and which will extend not only to the manufacture of beams and powerful stanchions, but also to that of particularly resistant slabs or plates for ceilings, etc.

In the construction of external walls having no supporting function, the aim should be primarily to realize the best possible protection against cold, heat, wind and humidity.

The thermic insulation of a wall depends both on its thickness and on the nature of the building material employed. Its improvement by increasing the thickness is based on a slackening in the interchange between the interior temperature of the rooms and that of the outside air brought about by a greater caloric absorption and accumulation by the wall. On the other hand, the improvement of the thermic insulation of a wall by thermo-insulating materials is based on their resistance to the absorption and penetration of heat. Consequently, two walls of different thickness but equally permeable to heat, behave very differently from the standpoint of thermic economy according to whether the thicker wall is composed of ordinary material and the less thick wall of thermo-insulating materials. The first consumes more heat than the second as, contrary to the latter, it also absorbs heat for itself.

The thermic insulating capacity of a material can already be ascertained by touching, from the fact that even if the temperature of the material is low, it seems warm because no heat is absorbed from the hand touching it.

The accumulation of heat effected by thick walls built of ordinary material still continues to equalize the temperature for a certain time after the source of heat has ceased; this may sometimes be advantageous for the environmental conditions of the rooms, but sometimes may also be disadvantageous. In regions with a warm climate where the temperature is high during the day and suddenly drops during the night, the said accumulation of heat is sometimes desirable, while it may become very troublesome if the temperature only falls a little during the night, as it will prevent having the coolness desired.

In rooms with thermo-insulating walls and ceilings, an interior temperature, differing from that outside, can be established and maintained more easily, provided that the doors and windows can be closely shut. On the other hand, all thermic insulation of the walls becomes illusory if an exchange between the interior and outside temperatures is possible through the joints of the doors and

windows which today usually cause about 30 per cent. of temperature losses with normal walls. As leakages can sometimes cause greater loss in heat than the use of the best thermo-insulating material can gain, an improvement in wall construction aiming at increasing their thermic insulation in regions with a harsh climate should be combined with a better fitting of the doors and windows. in this way, the atmospheric conditions of the rooms could be improved with simpler technical means and at a lower cost than is possible today.

The following table indicates in centimetres the wall thickness necessary, with the use of different materials, to equal the thermic insulation of a brick wall 38 cm. thick, today considered as normal though in reality it is not enough. The data regarding the different building materials only represent the approximate values which may vary between more or less wide limits according to the condition of these materials.

Wall thickness necessary, with the use of different building materials, to obtain the same thermic insulation.

Cork slabs	2.4 cm.	Brick wall	38 cm.
Slabs of fibrous material	2.5 »	Mortar	38 »
Felt padding	3.0 »	Rough cast	38 »
Woodwool slabs	3.6 »	Rammed earth or clay	42 »
Asphalt sheet	6.0 »	Cement after setting	42 »
Ripe wood	7.6 »	Slate	63 »
Wood cement	9.5 »	Reinforced concrete	63 »
Pumice stone concrete	18.0 »	Gravel concrete	78 »
Glass	32.0 »	Compact natural stones	110-140 »

Light building materials, in which the pores are as finely divided as possible and do not form canals through the mass, are those which best realize a good thermic insulation. Mention has already been made on several occasions of artificial materials such as pumice stone concrete, porous concrete, porous bricks and porous glass; they are all excellent light materials, the development of which has not yet been finished. They excel over ordinary building materials not only as regards thermic insulation, but also protection against humidity.

Certain materials which, in the dry state, are fairly thermo-insulating, conduct heat when they absorb moisture. In general, the more compact materials manifest this property to a higher degree than porous material. Thus, for example, in a brick placed vertically in water, this rises up to 20 cm. at the end of 3 ½ hours, while this rise does not exceed 3 cm., at the end of the same time, in pumice stone.

In the regions which have much rain and wind, the penetration of moisture into the walls has been successfully combatted by constructing the walls with two partitions separated by an air space: the external partition serves as a protection against wind and rain; the internal partition is thermo-insulating. The former surmounts the base of the wall so as to leave apertures where the

moisture penetrated through from the outside partition may find an outlet without having touched the internal partition. Such a double wall has nothing in common with the hollow wall, the danger of which has already been pointed out, consisting essentially in that the humidity which traverses the external partition cannot find any drainage and consequently, it accumulates and may even freeze in winter. If, in the said double wall, the external protective partition against wind and rain is rendered impermeable to moisture, the internal partition can be affixed to it; this would prevent insects and other noxious animals collecting in the aforesaid space, seeing that the space had been eliminated.

The health advantages, frequently recognized, of the use of clay as a building material on the farm, support the idea of again utilizing it and to a greater extent for the construction of modest rural buildings. Frequent investigations have been carried out on the technical properties of clay in road-making. These investigations have shown that by mixing small quantities of Portland cement, lime silicate or other binding materials with finely powdered clay (but only if in this form), the clay will withstand softening through moisture. Up to what extent may similar investigations regarding the use of clay as a building material be of practical importance ? It is not yet possible to give an opinion on the matter.

7. — Interior installations

Their development aims at increasing simplicity and convenience in rural buildings. First of all an endeavour is made to assemble all the principle conduits or pipes in a special part, easily accessible, of the building, which part should pass through it from the bottom to the top as near the centre as possible, so as to be well protected and provided with thermic insulation. The ramifications of the central conduits towards the periphery will thus have a simpler arrangement.

For the same reasons, the chimneys and ventilation pipes should occupy, in the buildings, as central a position as possible and be completely insulated. For the ventilation pipes in the stables, it would be interesting to ascertain if it were possible to regulate the elimination of vitiated air better and more simply by artificially heating only one air flue rather than by eventually establishing several ventilation pipes.

A remarkable trait of the development of interior installations consists in having objects, formerly movable, attached to the fixed accessories of the buildings. This is particularly the case for sanitary installations, as also cupboards which are being built more and more into the wall.

The increasing connexion between building and furniture also leads to a fixation of the latter which, up to the present, was not customary; this, however, is only of real value if it simplifies living conditions. Here also evolution goes ' from the primitive, through the complicated, up to appropriate simplicity ' which, in the case of rural construction too, is a goal that appears as a distant mirage.

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MISCELLANEOUS INFORMATION

Agricultural education in the Belgian Congo

Heer VAN DEN ABEELE, Director General of Agriculture at the Ministry for the Colonies, Brussels, and Delegate of the Belgian Congo at the International Institute of Agriculture, has published in the *Bulletin agricole du Congo belge* (1941, No. 2) an interesting article on agricultural instruction in the Belgian Congo. The following data which have been abstracted from this article will be an important addition to the information given in the IVth volume of *Agricultural Education in the World*.

GENERAL INSTRUCTION

The Belgian Congo possesses a very dense network of scholastic institutions, the progress of which has kept pace with the development of its vast economic resources.

At the end of 1938, the teaching staff was composed of 1,550 Europeans and 26,889 natives. About 18,000 elementary schools were attended by 721,637 children, which means that approximately 40 per cent. of the children of school age received elementary instruction. As in these schools there are about nine times more boys than girls, the proportion of boys benefiting from this instruction, therefore, is over 70 per cent. The majority follow the first grade courses in the rural schools established in practically all the villages and where they are taught by graduated native teachers.

The density of missionary occupation has promoted appreciably the spread cf instruction in general and elementary education in particular. Up to the present, the missionaries have created 508 stations by which they have contributed valuable assistance to the Colonial Government.

Secondary instruction comprises the high schools (for boys), normal schools (for boys and girls), vocational schools (wood-,iron-, leatherwork, clothing, etc.), agricultural domestic science schools.

There are also special schools, such as the schools of agriculture, which will be especially discussed in this study, military schools, schools for business training, schools of medicine, small and large seminaries.

The great majority of the pupils taking elementary instruction are from rural environments and destined to return there to take up farming.

The aim in teaching the natives is to educate them at least as much as to instruct them. This education should be based on instruction in work and especially in farm work, the most accessible to the general comprehension and, at the same time, the most pressing for the needs of the school, the family, the region.

Manual work and especially farm work are the pivot of scholastic activity in the elementary schools of the first grade and continue, in the second grade schools and even in the high and normal schools, to be one of the chief occupations. The first grade elementary schools cover two years' study; the second grade elementary schools three years. The latter schools are situated in the central stations, the former, in the rural and urban centres.

This agricultural work is always preceded and accompanied by explanations, elementary scientific and technical information, examples cited during the courses in literary instruction (history, geography, arithmetic, etc.) drawn as far as possible from nature, agriculture, and the simplest elements of biological science.

Special agricultural instruction

The organization of this instruction in special schools comprises two distinct branches:

(1) scholastic instruction;

(2) post– and extra–scholastic instruction.

The essential mission of agricultural instruction should be to rehabilitate the land from which the advanced or educated native unfortunately appears to wish to break away. It will be all the more efficacious the more attractive it is made and the better the pupil can understand the material advantages he will obtain from rational farming.

Methodology

Whatever the category of the institutions for agricultural education, instruction should tend to the following characteristics: be attractive within the capacity of the pupils; slow and repetitionary, intuitive and active, seasonal, practical, coordinated and well linked up, concentric.

The language employed is that of the native except in the agricultural high schools which at present constitute the upper grade and where French is spoken.

Agricultural instruction is given in the following categories of institutions: (1) High School of Agriculture; (2) Agricultural Vocational School; (3) Farm School; (4) Agricultural Practical Instruction Centre; (5) Courses for improvement and maintenance; (6) Training of agricultural teachers.

I. — High School of Agriculture

Aims

(*a*) Training of native agricultural assistants and native veterinary assistants (native staff of the Colony);

(*b*) Training of assistants to heads of agricultural, forestry and animal husbandry centres and research and experiment establishments.

At present there are three High Schools of Agriculture in the Belgian Congo which are under the administration of the Agronomic Centres of the University of Louvain (C. A. D. U. L. A. C.) which has, for each school, a director on the spot to organize and supervise instruction under the higher control of the Government.

The first High School of Agriculture, established in 1932 at Kisantu, recruits its pupils from the Lower Congo where stock-farming and the native peasants are well on the road to progress (truck crops, cassava products, fibres, groundnuts, oil palms, etc.). The teaching is entrusted to the Fathers of Mercy. A model farm is attached to the school.

A second High School of Agriculture was in augurated at Bunia in 1938 and the teaching staff was recruited in part from the Marist Brothers.

This school is magnificiently fitted up, possesses a large model farm and is situated near the mission of the White Friars at Mudzi Maria, in the wealthy agricultural region of Upper Ituri, characterized by an intensive food crop production for supplying the industrial populations at the gold mines of Kilo Moto. The native live-stock is abundant, and thus presents the advantage of enabling the native agricultural economy to be directed towards mixed farming.

The third High School of Agriculture was founded in 1937 at Kamponde. This school is situated in the centre of the populous, essentially agricultural, region of Kasï Lomani, where the cultivation of cotton, maize, groundnuts and the oil palm has made great progress. Instruction is given through collaboration between the C. A. D. U. L.-A. C. and the apostolic Curacy of Kasaï, which recruits the teaching staff from the Brothers of Mercy at Ghent.

The pupils who follow the courses at the High Schools of Agriculture are given the assurance that, if they successfully terminate their studies, they will be enrolled in the native staff of the Colony, if they so desire.

Admission

Admission to the High schools of Agriculture is authorized provided that the candidate has profitably followed the instruction given in a preparatory stage to the high schools of agriculture. To be admitted to these preparatory divisions, the candidates must have finished the full period at the elementary school or give evidence of having an equivalent instruction.

Duration of studies

The studies cover a preparatory year and four years of agricultural instruction properly so called. The students having successfully completed their studies, receive a diploma of 'Agricultural Assistant' or 'Veterinary Assistant' after a regulation term of probation of a year at the experiment stations of the National Institute for Agronomic Study of the Belgian Congo or with the exterior services of the C. A. D.-U. L. A. C.

II. — Agricultural vocational school

Aims

(*a*) Training of agricultural overseer (paid by the State, the native constituencies, associations and the colonists);

(*b*) Training of foremen of labour gangs in plantations;

(*c*) Training of farmers.

Admission

The ideal would be for the students to have concluded their elementary studies, but exception may be made for young natives having terminated the first three years of elementary instruction, aged over 16, and who fulfil one of the following conditions: if the candidate in question has worked as an agricultural overseer or foreman in plantations, as a rural teacher, is a native of a region where complete elementary instruction has not been organized.

The Colony reserves the right to engage all graduates of the Agricultural Vocational School and assures their upkeep for the duration of the studies for a trial period of three years.

Duration of studies

The duration of the studies is, according to school, from two to three years. A leaving certificate is given.

Type of instruction

Instruction is essentially intuitive and practical. Scientific elements are reduced to the strict minimum and avoided as far as possible without, however, detracting from the instruction in technical branches.

More than half the time is given over to practical work; seasonal instruction and in the neighbourhood is the rule.

Languages

The vehicular language employed is the common or maternal language for which courses in improvement are organized.

The best agricultural vocational schools at present are those of Bwamanda (Ubangi), Astrida (Ruanda Urundi) and Kabinda (Lomani).

Curriculum

Studies carried out *in situ et in vivo* on the practical work of the farm. The only subject to be studied is rural economy supplemented by some technical questions regarding agriculture and animal husbandry.

III. — Farm school

Aims

Training of good farmers.

Admission

To be admitted to the farm schools, the candidates must have completed the first grade elementary studies or have an equivalent instruction.

They should be at least 16 years old and be sufficiently robust to carry out farm work.

Duration of studies

The minimum period of studies is a year and the maximum, two years. A leaving certificate is granted.

Type of instruction

Instruction is essentially practical. The main principles of agriculture have to be shown without other demonstrations than the direct observations of the results obtained from the experiments carried out at the school.

The technical part is limited to instruction in a few elementary facts which are repeated until the pupils know them by heart. As far as possible, these elementary facts will explain the work realized in the field. They will refer to the food or economic crops of local importance.

A maximum of an hour per day is devoted to the repetition of the facts studied in the neighbourhood and to the discussion of a few other elementary points.

Languages

The language employed is that of the region.

IV. — Agricultural practical instruction centre

Aims

Agricultural pratical instruction aims at giving a regional agricultural practical training according to the local agricultural possibilities, within the limits of the local agricultural program decreed by the Government.

It tends to train more advanced farmers, good peasants, who will apply the principles they have learnt in their own environment.

This instruction is and should be accessible to all, men and women, literate and illiterate, whatever their belief or religion.

It is essentially practical and no theoretical instruction is given. Instruction is given chiefly in the open in the neighbourhood. It has to be popular and attractive to be efficacious.

Curriculum

This instruction should be based on the explanation of agricultural practices which have to be improved or introduced and should never go beyond the capacities of the region.

The following are some of the subjects to be adapted to local circumstances:

Importance of crop rotation.
Danger of soil impoverishment through erosion.
Maintenance of soil fertility.
Utilization to this end of organic matter of plant or animal origin.
Advantage and preparation of composts.

Utility of transforming plant waste into compost rather than reducing it to ash.

Danger of erosion.

Contour ridge cultivation.

Terracing.

Utilization of irrigation and drainage.

Grading of crop products.

Preparation of fibres, drying of cotton, preparation of nurseries for oilpalms, coffee, hevea, etc.

Feeding of large and small stock, poultry, etc.

Selection of breeding animals.

Separation of the sexes to prevent the young females being covered too soon.

Castration of young male animals for fattening.

Construction of hygienic housing for small stock and poultry.

Arrangement of simple kraals for large stock allowing for the collection of manure.

Conservation and rational utilization of manure.

Management of watering-places to prevent the propagation of parasites, trypanosomiasis.

Establishment and especially the utilization of adequate latrines in the districts where cysticercosis exists.

Liming of marshes.

Utilization of the dipping tank where its use is impossible.

Construction of trays for breeding silkworms.

Manufacture of silkworm gut.

V. — Courses for improvement and maintenance

Aims

To improve the agricultural knowledge of teachers and overseers not having followed the entire curriculum of agricultural instruction. To maintain or keep up and supplement the knowledge of graduates in agriculture.

To be admitted to these courses, the candidate must be a teacher, agricultural or veterinary assistant, agricultural overseer or carrying out the functions of same.

Duration of studies

The duration of period of instruction will necessarily vary according to the aim in view and the time the pupils have at their disposal.

In general, these courses will cover a cycle of lessons spread out over thirty to forty days.

Curriculum

The curriculum varies in each case.. It is adapted to local contingencies and to the necessities of the moment.

VI. — Training of agricultural teachers

Instruction in this category is being organized. Instruction will last a year and will be given at a normal school, a high school of agriculture or a vocational school of agriculture and will only be open to graduated teachers. In this way, ' agricultural teachers ' will be trained, chiefly for the rural elementary schools.

Another type of instruction is the *compulsory agricultural instruction*, essentially practical, given to the mass of the population in its usual surroundings and which, in twenty years of a system of compulsory crops (chiefly food crops) has yielded excellent results.

A. H.

Rice-growing in Hungary

The Minister of Agriculture of Hungary has examined the problem relative to the expansion of rice cultivation with a view to covering the requirements of the country which amount to approximately 300,000 quintals per year. The Hungarian National Irrigation Office has carried out important work on the selection and testing of 103 early varieties. This Office has chosen, as being particularly suitable to the conditions of certain Hungarian zones, the variety ' Dunghan Shali ' indigenous to Turkestan and the ' Versarley ' derived from a Bulgarian rice.

Harvesting, especially for ' Dunghan Shali ', should be carried out by hand and with care so as not to lose any part of the crop. The loss in weight during drying of the grain is from 15 to 20 per cent. In Hungary as in China, the raising of ducks in rice-fields is advocated as a secondary resource.

The annual quantity of water necessary for rice-growing varies according to the climatological conditions and the permeability of the soil. The important waterworks on the Tisza near Tiszafüred and the large Nagy Alföld irrigation canal (Hungarian lowland) would enable 1,900 ha. to be grown to rice, while 6,000 ha. with an average yield of 50 quintals rice per hectare, would be necessary to cover the requirements of the country. Rice requires a total temperature of 3,000° C.-days, distributed over 1,400 sunny hours during the period May-September. The zone of the Hungarian lowland to the south of the line uniting Dunafölvar-Kecskemét-Szolnok-Hortobágy-Debrecen where this type of calorific distribution exists and where the soil is relatively impermeable and easily irrigable, would be the most suitable for this crop.

Moreover, some soils of this zone are cultivated very little owing to their salinity due to the presence of sodium sulphate and would be most suitable for rice, as this crop grows well in saline soils provided that a top layer of at least 20 cm. is free from salts; this is the case in the region in question.

It is not necessary to follow a crop rotation if nitrogenous fertilizer is applied every year. A good phosphate fertilizer with a little potash is useful so as to intercalate every three years a lucern crop to destroy weeds and especially *Panicum crus-galli* which is the most dangerous. The elevation of the water to be maintained in the rice-fields varies between 5 and 10 cm. The plants should not remain submerged for a long time, but only during the nocturnal and morning hours when the temperature is lowest. The level of the water throughout the period of growth and maturation should stand at half way up the stalk and should be drained off two weeks before harvesting. (From *Öntözésügyi Közlemények*, Budapest, 1940, No. 1).

G. S.

BOOK NOTICES *

INTERNATIONAL INSTITUTE OF AGRICULTURE. *Classification scheme of agricultural sciences*] second revised and amplified edition. Rome, 1942, XXV, 183 pp., 25 lire.

[This Classification Scheme, which since the first edition has met with the most favourable reception—and which, for some years, has been out of print—has just come out in its second edition, considerably amplified and brought up to date. The Scheme takes its early origin from the first studies made by the author, Dr. S. VON FRAUENDORFER, on the problem of the classification of agricultural science, studies which concluded in a thesis presented at the University of Illinois (U. S. A.) in 1927. Since then, the material contained in this study was continually improved. A preliminary tentative at practical application was made in 1930 in a roneotyped trilingual edition (the original was written in English only), which was submitted for criticism to the agricultural librarians and specialists of the different countries. It was only subsequently that the definitive edition was started.

The work encompasses agricultural science in the widest sense of the word. It is enough to glance at the summary of this volume to undertand the vast scope of the interests on which agricultural science touches. Apart from plant and animal production which are treated from both general and special aspects, there are naturally the auxiliary subjects as—to cite but a few—mechanics and agricultural improvements, the vast field of agricultural technology, agricultural education, agricultural history and geography, agricultural legislation and—in ' Agriculture in general '—all the basic sciences, for example, chemistry, geology, meteorology and others. Compared with other classification schemes, in this Scheme particular attention has been given to the social and economic aspects of agriculture. It is known that agricultural economics is rather a new science, and it is precisely in the Classification Scheme of Dr. von Frauendorfer that a complete and very detailed classification of this branch of agricultural science is found for the first time.

All the subjects of this wide field are classified into fifteen main groups, each being indicated by a capital letter of the alphabet; each main group in turn is divided into secondary groups denoted by numbers which follow in succession according to the decimal system. The indices rarely exceed three figures, so as to obtain symbols simple and easy to memorize.

The main scheme and the auxiliary tables are extensively developed; they comprise nearly 2,500 subjects, which thus makes it possible to classify with precision the most detailed subjects. Thus, for example, each cultivated plant has its specific number, each sphere of agricultural economics is designated with the same exactitude. Consequently any catalogue or card-file based on this Scheme, immediately and at first sight offers a complete list of the resources of the collection of books or documents that it represents. Another particularity of this classification is the fact that all the subjects are presented in synoptic tables in three languages (French, English, German). Moreover, to facilitate consultation, the names of the different cultivated plants are also given in Latin.

When it is a question of agricultural products of primary importance such as wheat, cotton, etc., or of domestic animals, for example, cattle or poultry, or else in the case of other subjects which give rise to an extensive special literature, a more specific subdivision of the subjects becomes necessary. The two auxiliary tables of the Scheme serve this purpose. One refers to the geographical subdivisions, the other to analytical subdivisions. With the first, the subjects can be classified according to country; to these corresponds a determinate number which—placed in brackets—follows the notation of the main scheme. The analytical subdivisions serve to define more exactly the aspect and content of the book; if it is a question, for example, of a work of a sta-

* Reviews of books presented to the Library appear under this heading.

tistical or historical or bibliographic character on wheat, cotton, cattle, etc., to the notation of the main subject will be added an auxiliary notation, formed of a small letter and a number, which are taken from the main tables of the Scheme.

Finally the use of the classification is greatly facilitated by the alphabetical indices. These three indices, to which is added a list of the Latin names of about 500 cultivated plants, may be utilized not only for bibliographical studies, but also indirectly as a trilingual dictionary of agricultural science, supplementing the few specialized lexicographical sources which exist in this field.

The work has the great advantage of benefiting from the long practical experience of one of the most important agricultural libraries of the world. In fact, the Library of the International Institute of Agriculture, which comprises a total of nearly 350,000 works and over 3,000 current periodicals, has for over twelve years been the experiment field of the Scheme in question. The work, therefore, takes into account the special requirements which result from practical bibliographical work, while other classification schemes are, too frequently, based on rather theoric and abstract concepts. In this way, it was possible to follow close at hand all the new developments in the field of world agriculture and in particular, the social and economic aspects. The new edition of the Scheme comprises, therefore, a considerable number of new subjects and subdivisions, or modifications in the interpretation of the already existing keywords. In fact a bibliographical classification should be, like the work in question, a living organism which adapts itself to the continual development of human knowledge].

V. C.

KRUEDENER, A. (Freiherr von) und BECKER, A. *Atlas standortkennzeichnender Pflanzen*. Berlin, Wiking Editor, 1941, 156 pp., 52 plates. Price 28.80 RM.

[As the authors state in the preface, this Atlas of plants which characterize different environments is intended primarily for engineers. It ought to attract their attention to the plant world, lead them to observe exactly what occurs and to indicate to them the conclusions which can be drawn from plant covers regarding soil and water conditions. Such an examination of soil conditions, however, interests equally and even more so, the farmer and therefore this book should be both instructive and useful to him.

Out of the entire plant world, the authors have selected 60 species considered as being characteristic of certain local conditions. Five groups have been formed composed respectively as follows:

Group 1: Plants which have a typical connexion with water and which thus characterize the different stages of water movement in the ground up to stagnation.

Group 2: Plants which characterize a certain pedological structure by the fact that they prefer some special type of soil: sandy, marly, clayey, etc.

Group 3: Plants characterizing organic matter, from good humus to peat.

Group 4: Plants which reveal the presence of minerals or rocks: calcareous, diabasic, basaltic, etc.

Group 5: Some plants suitable for fixing the soil, which may be of considerable importance in the control of soil erosion.

Fifty-two plates and numerous diagrams inserted in the text represent these characteristic plants as regards their association with other plants, their habitus and peculiarities. The schematic designs give, for each of the species mentioned, a clear picture of the relation between plant and environment.

Besides a description of the external characteristics and the vegetative requirements of each plant species, indications are given on its importance for agriculture and forestry. A synoptic table of 4 pages assembles the principle properties of the plants mentioned in regard to: their ability in the fixing the soil—their aptitude for indicating moisture conditions, state and structure of the soil as well as the humus content of the soil and the pH. This table also gives an idea of the multiple indications furnished by the flora on environmental conditions].

N. v. G.

CAVERO BLEGUA, Miguel. *Calculo gráfico de canales de aplicación agricola*. Madrid, Dossat Editor, 1941, 10 pp., 24 graphs.

[The author, a specialist in irrigation work, has assembled in the form of tables or graphs, the results of a whole series of calculations established systematically. These calculations will facilitate the drawing up and execution of the irrigation projects at present under consideration or in the course of realization in Spain, with a view to the transformation of the numerous irrigable zones. They will also aid in the development of small scale irrigation, contributing at the same time to an easier execution of agricultural hydraulic work in general, as regards small section canals.

In this study, rules have been drawn up and appropriate graphs devised for the determination and rapid calculation of hydraulic sections of a water delivery below 1,050 litres per second, comprised in the six geometrical types of the sections most utilized, for the most common longitudinal slopes and a water velocity appropriate to the resistance of the canal walls.

In this case, it is not a question of pure science, but simply of facilitating by means of a systematic series of calculations bearing on thousands of sections, by bringing to bear the variables: small base, water elevation, incline, form of the section and slope; incline, form of the section and slope; determining in each case, the corresponding velocity and delivery.

These calculations refer to canals of the essentially agricultural type, for the supply and distribution of water for irrigation, not taking into consideration the large canals for extensive irrigable zones for which the technique corresponds to other branches of an eminently constructional character.

Technicians engaged in this work will find this publication of great assistance].

A. P.

NEW PERIODICALS RECEIVED BY THE LIBRARY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE

for the first quarter of 1942 (*).

BOLLETTINO di legislazione scolastica comparata. Ministero dell'educazione nazionale. [Roma], v. 1 (1941)–, mens. L. 40.– int.; L. 80.– étr. (Direzione generale delle Accademie, Biblioteche e affari generali).

BROTÉRIA. Série trimestral: Ciências naturais. Lisboa, v. 1 (28) (1932)–, trim. 35$00 int.; 8 *s.* 5 *d.* étr. [Cumulating: "Série botânica" and "Série zoológica"].

GRANJA. Sindicato nacional dos regentes agrícolas. [Lisboa], v. 1 (1940/41)–, mens. [The farm].

MILAN. R. Stazione sperimentale per la seta. Pubblicazioni della R. stazione sperimentale per la seta; estratte dalla rivista "La Seta", Milano, n. 1 (1940)–, irr.

NOTE ed appunti sperimentali di entomologia agraria. Perugia, n. 1 (1931)–, irr. (R. Osservatorio fitopatologico. Sezione: Entomologia agraria presso la Facoltà agraria di Perugia).

(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice monthly); bimestr. (every two months) déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular) mens. (monthly); n°. (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

N. B. — Between brackets [/] are given translations and explanatory notes not appearing in the title of the review.

RACCOLTA delle disposizioni concernenti l'alimentazione. (Supplemento straordinario al Bollettino ufficiale del Ministero dell'agricoltura e foreste). [Roma], Libreria dello Stato, n. 1 (Sept. 1941)–, bimens. L. 3.– int.; L. 6.– étr. per issue. (Ministero dell'agricoltura e delle foreste. Direzione generale dell'alimentazione).

RASSEGNA del geometra; mensile di tecnica e di amministrazione della proprietà immobiliare. Brescia, v. 4 (1940)–, mens. L. 20.– int.; L. 40.– étr.

REVISTA del Ministerio de agricultura, comercio e industrias, Asunción, v. 1 (1941)–, trim.

RURAL electrification news; issued monthly by the Rural electrification administration U. S. Department of agriculture. Washington, v. 6 (1940/41)–, mens. $ 0,75 int.; $ 1,50 étr.

TECNICA fascista; periodico degli ingegneri. Milano, v. 7 (1941)–, bimens. L. 15.–

TECNOLOGIA chimica; rivista mensile dell'ingegneria chimica coi supplementi: "Olii-grassi-saponi" e "Commercio chimico". Milano, "Aracne", v. 8 (1941)–, mens. L. 50.– int.; L. 75.– étr.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

PRINTING OFFICE CARLO COLOMBO — ROME, MARCH 16, 1942.

MONTHLY BULLETIN

OF

AGRICULTURAL SCIENCE AND PRACTICE

SOIL DETERIORATION IN THE BELGIAN CONGO, THE NECESSITY OF SOIL CONSERVATION AND THE POSSIBILITY OF SOIL RECLAMATION WORK

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The article kindly contributed by M. R. Thomas comes within the series of studies on the various aspects of soil conservation published in this Bulletin. It is the first treating on a tropical country and the author has ably thrown into relief the specific salient features of soil deterioration under a tropical climate and in a country existing under the economic conditions resulting from recent colonization where the primitive agriculture of the natives comes into contact for the first time with the intensive agricultural methods employed in European estates.

Before treating on the deterioration and reclamation of Congolese soils, therefore, the reader had to be informed on the climatic and soil conditions prevailing in the Congo. The author does not end in indicating water and wind erosion as the sole causes of soil deterioration; in the third chapter he describes the many varied factors which come into play in tropical countries. The control measures are amply discussed in the concluding chapters.

SUMMARY: Preface. — I. Preliminary note on colonial soils and, in particular, on Congolese soils. 1. Atmospheric climate: (*a*) Temperature; (*b*) Rainfall; 2. Soil climate: (*a*) Temperature; (*b*) Humidity; 3. Soil cover: (*a*) Living cover; (*b*) Dead cover; 4. Humus. — II. Characteristics of Congolese agriculture as regards the soil. 1. Native crops. (*a*) Former régime: *a*. So called Bantu forest system; *b*. savanna system; (*b*) Present régime; 2. European crops. — III. Deterioration of Congolese soils, its chief causes and some of its aspects. — IV. Necessity of maintaining and, if possible, of increasing the fertility of the land at present occupied and of husbanding the soil reserves for the future. — V. Measures suitable for preventing deterioration, for checking progressive loss in fertility and for reclaiming soils not excessively deteriorated. Preventive measures. Curative measures.

Preface

When some disaster takes place, as when an entire region is flooded, when a torrent devastates a valley or when a landslide engulfs several mountain villages, public opinion is aroused and measures are taken to remedy, as far as possible, the causes of the catastrophy and to prevent its repetition. Always, in such a

case, popular feeling is impressed by the seriousness and especially the suddenness of the disaster, even when the damage is generally fairly localized, frequently in part reparable.

There are other disasters, however, which, being less spectacular, have much more serious and lasting consequences. In this category comes that which we propose to discuss here, namely, soil deterioration; its most frequent form, if not the most tangible, is erosion.

Although far from being insignificant elsewhere, soil deterioration is particularly marked in tropical regions, especially in the mountainous zones. There the settlers and natives take some vague measures to control erosion but they only see the most apparent manifestations and the most immediate consequences. Except in but a few rare countries, the governing authorities are scarcely better informed on the question; to judge from their policy or rather their want of policy, they do not seem to be aware of the danger which menaces the countries they govern.

Yet, in several countries, within the last few years considerable literature has been launched by experts on ecology and soil science who, with a disquieting simultaneity, have denounced the damage caused by erosion, its causes and indicated means of checking or attenuating its effects, all this in combination with a number of studies on tropical soils, their formation, structure and the origin of their deterioration.

Worthy of notice is the fact that at the time of the 1929 session of the International Colonial Institute held at Brussels when 'The intensive and rational extension of native crops' was discussed, no mention whatsoever was made of erosion, soil deterioration, the particular influence of climate on the rapid loss of soil fertility nor of the necessity of a sufficient humus content to maintain the soil. What gives food for thought is that when the primeval importance of these problems was not in any way understood—in the contrary case, this silence, to say the least, would be strange—the native methods of cultivation, the practice of including fallow in crop rotation, etc. are only incidentally mentioned in the reports, without any indication of their possible effect on the evident short productivity of farm lands. In our opinion, twelve years ago the essential was simply omitted.

The damage caused by erosion only occurs gradually and even imperceptibly but is continuous throughout the course of years, centuries, sometimes even millenaries and one remains aghast at the extent and seriousness of its consequences: its influence is no longer denied as regards the evolution of the peoples of the Mediterranean basin, which, however, was the cradle of brilliant civilizations and the home of prosperous groups.

In Western Africa, it is now considered that the dryness is due to an erosion of enthropic origin and it is no longer attributed as formerly to climatic causes, nor to the encroachment of the desert in the presaharan, even presahelan, zone. The same reason probably holds good for the still more marked dryness of the south-western basin of the Red Sea.

In the United States of America, erosion has made unfit for any profitable cultivation an area larger than one of the Congolese provinces.

In our Colony, although erosion is of less intense and probably more recent effect, this phenomenon merits no less very careful study. It is fairly general throughout, although to a varying extent, but is chiefly found in the mountainous regions, particularly in the East, as well as in the savanna regions having a well marked dry season. In fact, rather than erosion only, there are the different connected forms of soil deterioration which are involved, as will be seen further on.

It is not in any way claimed that the following chapters, in their necessarily succinct form, constitute a fairly complete review of this vast problem. It should only be considered as a contribution which may assist in the study of a problem which concerns in the highest degree the future of Congolese agriculture and, consequently, of the Congo itself.

I. — Preliminary note on colonial soils and, in particular, on Congolese soils

The following aims at elucidating those characteristics of these soils which directly concern the subject treated here.

By colonial soils are intended those of the regions lying between the two Tropics, on both sides of the Equator.

It no longer seems doubtful that, among the factors determining the formation and the development of surface soils, the climate factor should be regarded as dominant, the other factors only playing an accessory role.

Taking as the basic fact that the soil reacts in a constantly identical manner to the influence of climate, some investigators consider that determinate climatic conditions produce soils always alike. This is the equivalent, therefore, of admitting that soil is purely the result of climate, each type of which would produce a uniform soil.

Although it has been remarked that rocks of widely differing composition may give, under the same climate, soils chemically and mineralogically similar, this, then, should be true in every case and the belief just cited appears a little too absolute; furthermore, it necessarily implies, with sameness of climatic conditions, also that of certain other conditions. In any case, if this argument is practically confirmed for the soils of the equatorial zone, which show fairly uniform characteristics, this is not the case for the soils of tropical zones which are subjected to more varied local conditions with consequent reaction.

On the whole, however, we consider that the Congolese soils may be classified into soils of the equatorial zone and soils of the tropical zones, which will be denominated more briefly, but not without purpose, equatorial soils and tropical soils.

The first occur between roughly the meridians E. G. 18° and 30° and the parallels 4° North and South, although the second gain by fairly wide encroached areas at the four angles of the vast quadrilateral thus delimited; the *equatorial* soils, therefore, are found in a zone with a high temperature, perceptibly constant (weak seasonal and daily amplitudes), having an appreciable annual rainfall

(from 1,500 to 2,000 mm.) and practically no or only a slight dry season; the plant cover is dense and permanent—excepting clearings and edaphic glades—whence, in general, maintenance *in situ* of a thick layer of surface soil (often several metres) sometimes fairly rich in organic matter. It is the habitat of the rain forest called the equatorial type, primary or more or less become secondary. As this formation barely covers half the surface of Congolese territory, it may be concluded that the area of equatorial soils is undoubtedly slightly under this half, proportion which the majority of the neighbouring African countries are certainly far from attaining.

It may be deduced that *tropical* soils are rather in the majority in the Congo; they are localized chiefly to the North and South of parallels 4°, plus the aforesaid encroached areas, that is to say therefore, in two zones where heat and humidity are no longer combined in a permanent manner or in the condition required for the upkeep of soil qualities:

in the North, approaching the thermic Equator, great heat, sometimes even excessive but a marked or very marked dry season, increasing in some parts of the extreme east practically to semi-aridness;

in the South, heat diminishing progressively with increase of latitude and altitude, dry season more and more evident in proportion as the distance from the Equator augments (at least six months in the extreme south) drying air current effecting a vast zone;

on both sides, lower rainfall than in the equatorial zone and amplitudes of temperature already considerable, plant cover never very dense, often intermittent or interrupted, shade insufficient against insolation and pelting rains, periodical brush fires, surface soil not very deep because subjected to constant scouring, humus content rarely adequate owing to the above-mentioned phenomena, in brief, an ensemble of conditions eminently propitious for soil deterioration and particularly for erosion and laterization; it is an environment of savannas which, according to the region, are wooded, shrubby, grassy, or composed of a mixture of these forms; it is here also that the most broken land is found.

Naturally, such a classification of our soils is not in any way absolute and in one or other of these zones, frequently terrains are to be found, sometimes fairly large in extent, which show characteristics which belong fairly or very closely to those of the neighbouring zone; question of local climate perhaps?

Nevertheless, as a whole, the environment of equatorial soils and that, quite different, of tropical soils have had the effect of creating in some way two types of specific land, with their special aspects, qualities, defects and aptitudes and in particular, their reaction to the causes of deterioration

By way of mention, it will be recalled that a good soil should be and remain fresh, permeable and porous although fairly coherent; in most cases every soil which will normally keep humiferous will present these qualities, it being understood that the depth should be sufficient.

These few very general data necessitate, however, supplementary indications on the environment in which our soils are formed and developed.

1. — Atmospheric climate.

On this subject there will be but to add some details to what has been mentioned above.

It may be noted from the very first that, account taken of the very extensive area of the Congolese territory, it is evident that to the two important climate-types already mentioned with reference to soils, are connencted diverse local climates occasioned by differences in latitude, relative and absolute altitudes, exposure, etc., which directly influence climate, affect the soil.

(a) *Temperature.*

In so far as an average temperature for the Congo can be indicated, it should be about 25°C.; the isotherms 28° and 26° pass respectively to the North and well to the South of its territory, but the lowering of the true average is very likely due to the action of the local factors just mentioned.

Therefore, there is a variation of some fifteen degrees as regards the average temperature of the atmosphere (9°) in Belgium

There is no winter cold or frosts here but there are other causes of reduction in temperature the effect of which is considerable: increase in altitude (approximately 0.6° C. per 100 metres), interruption of insolation and nocturnal radiation (especially during the dry season in tropical zones), prolonged downpours and hail storms (sudden drop in temperature as much as 10°), dense forest groves (1 to 2° lower than in the neighbouring cleared areas), cold marine current (coastal region), etc.

(b) *Rainfall.*

As in the case of average temperature, the rainfall average can only have a very relative significance, but it will be given to have some idea of it; comprised between the extremes of 800 and 4,000 mm., it stands approximately at 1,500 mm. or double the corresponding Belgian figure. It should be noted that the zone where the annual rainfall exceeds 1,500 mm. covers about 40 per cent. of the area of our Colony.

The rainfall depends on external and local cuases and, consequently, there is a great difference in the distribution and volume of the precipitations, two fairly close localities frequently having an entirely different type of rainfall. These causes are, in the case in question, as follows (in order of importance): action of air currents, moist (Southern Atlantic) or drying (Egyptian current, from the Indian Ocean, foehn), presence of mountain massifs generators of cold and condensations, relative proximity of vast arid zones, etc. But, more than the absolute quantity of water fallen, the intensity and distribution of the rains are what particularly concern the soil, as will be seen further on.

It is important, however, not to under-estimate the role of occult precipitations (dew, mists), which constitute an useful contribution in certain regions (Mayumbe, Kivu, etc.).

Excess rain, however, is not so favourable to the soil as might be supposed; on the contrary, by increasing leaching, it leads to an impoverishment of the ground, ending in different ways in a result fairly similar to that caused through insufficient rains and specially their inadequate distribution throughout the year.

Soil requirements, therefore, are mixed up with those of human ecology, which—keeping to the subtropical zone—is much better adapted to moderately humid climates without excessive heat, than to extreme climates.

Considering that the direct influence of the two principal climatic elements (temperature and rainfall) is intensified by a connected action of corresponding intensity emanating from certain other meteoric phenomena (production of ozone, contribution of ammonia, nitric acid, etc.), one should grant, therefore, to atmospheric climate the importance it merits, expect to find its imprint in the different manifestations of soil evolution, as biological activity, and recognize that it imposes the adoption of cultivation methods suitable for preventing soil deterioration, particularly in the fairly dry regions.

In this respect, it must not be forgotten that its participation in the process of the formation and destruction of humus is predominant.

Some investigators consider that " the further away from the Equator, the longer and more marked the dry season and the more susceptible the binomial soil + vegetation to atmospheric climate". They also estime that, of two climates with dry periods of equal duration, that which comprises two dry seasons and two rainy seasons is less unfavourable for the soil than that which has only one dry season and one rainy season; for this, all other conditions of relief, protection, etc., would probably have to be comparable.

It is, perhaps, to this peculiarity that the remarkable width of the gallery forests along the small water-courses, subtributaries on the north bank of the Uele should be attributed; the interruption of the dry season would enable the soil to protect itself better against the evolution towards the tropical type and, consequently, against the encroachment of the savanna covering the gaps in the galleries.

Another example of the imprint of climate is furnished by the forest of the western slope of the ridge of Kivu: two contiguous cantons subjected, one to the action of the austral Atlantic current (moist), the other to the local drying influence of a foëhn current, present respectively the rain forest (equatorial) type and the sclerophylous forest type.

The best proof, however, is given by N. Boutakoff, because it applies more directly to the case of oil. According to this geologist, the red soils resulting from the decomposition of basalt which are found in Kivu would appear to date from an early climatic cycle with a dry and hot climate and would no longer be formed today; in the rain forest, they are found with their red colour under the humus layer resulting from this forest of latter appearance, while in the cleared zones they are deprived of humus and constitute the mediocre coffee lands we know. If, from the above, it results that the present climatic conditions, especially in the forest, would no longer be propitious for the formation of such a soil, there is some basis to believe that the climatic factor has indeed a preponderant influence, perhaps even decisive, as regards soil formation.

LAVAUDEN is of the opinion that the forests are not in any way the product of the soil, but instead the result of prior climatic and biological conditions. This assertion does not differ so much as would appear from the current opinion, which attributes to the physical qualities of the soil a predominant role since, precisely, these same qualities are closely bound up with the atmospheric climate and more particularly with rainfall distribution.

What should be particularly remembered from the above is the pre-eminence of the soil factor which, function of the former, would have, from this fact, a lesser influence on biological phenomena; as, on the other hand, we have no influence on climate, perforce we have to adapt our technique to its exigencies. It seems a truism to state that crop distribution depends on climate; the connection is evident in what regards plant growth, fruit ripening, etc., but is much more rarely seen in what concerns the soil which bears these crops.

Consequently, there is a second aspect of the problem: apart from the zone subjected to an equatorial climate, particularly if the region is mountainous, clearing for crops will take a heavy toll of the reserves of arable land, because the regression of subsequent secondary formations, more or less rapid or slow according to position, is, nevertheless, certain, keeping pace with soil deterioration; the long forest fallow, characteristic and safeguard of the cultivation system called Bantu, can only, consequently, take place within the limits of this same zone.

Such will also be the case in disafforestation as the natural progressive reconstitution will only be found practically possible under this same equatorial climate. Also, we believe that it would be of great importance to make a map of the zone where this climate prevails; this map would also include information of an orographic order, making it possible to place the regions where sloping land is frequent.

2. — SOIL CLIMATE.

This is the relation which exists between the temperature of the soil and its humidity, which are closely connected with those of the atmospheric climate; the climate of the soil is in direct relation with its constitution, as the capacities of heating, absorption and retention may vary considerably from one terrain to another.

It is hardly necessary to insist on the importance of this pedoclimate, as it intervenes to the highest degree in the physical phenomena, chemical changes, and biological activities which have their seat in the soil. It will be seen further on that an element of the latter will play a primary role; this element is humus.

(a) *Temperature.*

Several investigators have already observed that the soil temperature is generally slightly higher than the temperature of the superjacent layer of air.

The following, by way of comparison, are some average annual temperatures recorded at a depth of 10 cm., in Belgium and in the Congo:

Uccle (alt. 100 m.)	10.8° C.
Yangambi (central basin) (alt. 470 m.)	maximum about 40° C.
» » » (alt. 470 m.)	between 24° and 25° C.
» » » (alt. 470 m.)	between 22.5° and 23.8° C.
Kivu (about 2,000 m.)	approximately 18° C.

The temperature of the soil decreases with the increased cloudiness of the sky, the extent of the shade furnished by the cover and with depth; in our opinion, the cover is the most convenient moderating agent of the temperature of the soil.

Although rainwater usually has approximately the same temperature as the environing air, it happens that, like the latter, the soil is suddenly cooled through prolonged downpours and hailstorms; in this latter case, cooling will extend in depth all the more rapidly and longer the greater the thickness and duration of the deposit of hailstones.

Sudden variations in temperature and insolation here have a more marked disintegrating action than that of frost in temperate climates; moreover, insolation also affects other phenomena and, in this regard, attention is called to the importance of the nature and colour of the soils and especially of the soil cover on their heating capacity.

The relatively high temperature of the air soil, together with moist environment, stimulates the development of superior plants, but also that of micro-organisms. The optimum temperature for bacterian activity is approximately 30°C., but this activity is already considerable at a lower temperature, while cryptogamic activity withstands appreciably lower temperatures. The first is the type which predominates in the Congo and, as it is the principal cause of the destruction of organic matter, this is equivalent to saying that the heating of the soil plays an important part in this destruction, although, however, it does not exceed a certain limit; humus accumulates below 22°C.

On the other hand, the manifestations of a biological order are not the only ones which receive a powerful impetus from increase in soil temperature; physical phenomena and chemical exchanges are also influenced and it is estimated that their rapidity and consequently their intensity are the consequence of this increase: it is doubled and quadrupled respectively by an increase of 10° and 20°C.

(b) *Humidity.*

It has already been shown that the climatic factor was preponderant at the time of the differentiation of two important categories of the soils of inter-tropical regions; likewise, the close relations existing between atmospheric climate and soil climate were also indicated.

Now, except at high altitudes and perhaps also towards the extreme south of Katanga, these two soil categories receive an amount of heat, the variation in which does not appear to justify such wide differences. We also believe that these are due rather to conditions quite distinct of the water distribution in equa-

torial soils and in tropical soils, that is in the regions where the dry season is practically non-existent and in those in which it is more or less long.

This does not signify evidently that the temperature, in this respect, has no action; quite on the contrary, the elevation of the thermic degree, on the one hand will enable the water to circulate easier and more rapidly in the soil, on the other hand, it will increase in proportion the water requirements of the soil, chiefly through evaporation and plant transpiration

It is estimated that in France one hectare of broad-leaved forest daily sucks up through its roots 25,000 to 30,000 litres water and evaporates 5,000 m^3 per annum or, in other words, a layer of water 50 cm. deep and the three quarters of the annual rainfall; under the same conditions, a hectare of oats and a hectare of wheat evaporate layers of 23 cm. and 12 cm. or, respectively nearly a third and nearly a sixth of the total rainfall of the year.

Taking into account the greater heat and the absence of repose in plant growth it is very probable that the Congolese forest evaporates a quantity of water at least double that of the European forest, that is, a layer of over a metre, and that the requirements of cereals, such as maize and sorghum for example, are about in the same proportion.

If, in the equatorial zone, the total of the diverse precipitations is considerably over one metre, however, there are many tropical Congolese regions where the rainfall only slightly exceeds this quantity, when it is not lower. Only a part of this rainwater being absorbed, the difference between this part and the total volume eliminated through evaporation of the soil and through chloro-evaporation can only come from the reserves held in the soil; this evidently implies that the conditions necessary for the regular supplying of these reserves are fulfilled.

The marked differences seen between the two zones as regards the rainfall distribution and consequently, the water system in the soil, are evidenced by corresponding differences in the yields of the equatorial and tropical soils; with an equal output, the second will be appreciably richer than the first—the relative uniformity of their characteristics is here recalled—as a mediocre soil insofar as regards mineralogical and chemical composition can give an adequate yield if its physical condition enables an effective circulation of air and water.

This favourable physical state, it will be seen further on what are the conditions of its upkeep and what are the causes of its frequent deficiencies.

Much more than the total quantity of water received in the form of the diverse precipitations, what is important is the quantity absorbed, particularly that preserved by the soil; the quantity preserved represents a much smaller part of the whole than is generally imagined. The soil must be very permeable—exceptionally the case—for 10 mm. rainfall to be completely absorbed; also, even with a slight increase either in intensity of rainfall, in the slope or the compactness of the land, the volume of water which percolates through diminishes considerably (nine tenths sometimes) down to practically zero in some instances.

The underground waterlevel, which shows little variation in the equatorial zone, undergoes considerable fluctuation in tropical zones, all the more so as the dry season is longer and more accentuated. Drought, therefore, pushes the water level more or less away from the surface, however, this unfavourable influence

may be considerably intensified by certain peculiarities of the terrain: broken relief, shallowness, severe erosion, for example.

The comparison just made regarding the water requirements of European and colonial forests gives some idea of the essential role of all the factors which contribute to assure soils an adequate absorptive and retentive capacity, as it is on this capacity that the formation of underground reserves chiefly depend.

For some years, the circulation of the water in the soil (descending, ascending currents, etc.) has rightly been the subject of studies by the specialists of the different colonial countries, from which its full importance can be understood; the process of the transformation of tropical soils especially depends on this circulation.

No more than they can disregard the causes and effects of run-off, the cultivation practices applied in colonial countries cannot, without showing themselves to be of very little efficacy, ignore the essential of water movements in the layer explored by the roots as well as the minimum moisture capacity of this layer during the critical period, that is to say, at the end of the dry season. If informed on this point, *inter alia*, the true agricultural possibilities of a land will not be definitely known, while a choice which, at this same period, will give a good guarantee as regards the water reserves of the soil, will have a good chance of being fortunate.

Unseasonable droughts, so often very harmful if not disastrous, will in every case, be less to be feared where the vegetation will be able to benefit opportunely by a supplement of deep-lying moisture.

At the very least, when it is a question of tropical soils, the agricultural prospector will do well to verify first their state of freshness at the most unfavourable period; such observations will usually give him better information on the true degree of fertility of a soil than certain suppositions of fertility deduced from various indices, important certainly in other respects, but frequently too absolute; many times, moreover, state of freshness and indices of fertility will give concordant indications. It is understood, naturally, that this refers to normal soils, to the exclusion of those suffering from excess water (marshes, lands flooded periodically, etc.).

The water movements of colonial soils are quite different and of a much greater range than those in the temperate regions; the inexperienced farmer, accustomed to Europe, will be disposed to serious errors. This is one of the angles under which the policy of agricultural settlement to be adopted should be examined.

3. — SOIL COVER.

The cover is the surface layer which immediately lies over the mineral soil; two types are distinguished—living cover and dead cover.

Most of the views expressed earlier on have prepared the way to discerning the various aspects of the protective role of covers and it is not necessary to go into full detail on the subject: mention will be limited to the chief of these: protection against sudden fluctuations in soil against light radiation and its bac-

tericidal influence, against drying up of the soil, especially by excess direct evaporation, against the mechanical action of rain and the subsiding which results, against run-off and consequently erosion, by increase in the imbibition capacity of the soil and by the effect of obstructing surface flow of the water not absorbed.

These are rather the physical aspects of this protection, its ' external side ', if one may say so; the other aspects will be given in their place.

(a) *Living cover.*

In temperate countries, especially in Western and Central Europe, where intensively farmed land is largely represented, the question of cover, in fact, interests practically only the forester. It is otherwise in intertropical regions where, in every case, there is a tendency to give increasing importance to soil protection.

For this reason, taking up this position particularly from the pedalogical viewpoint, we will consider as constituting the living cover the whole of the vegetation, spontaneous or otherwise, whether primary rain frorest, grassy, shrubby and wooded savannas, grasslands and other high-lying formations, composite flora of fallow land, or even crops.

Thus understood, the plant cover which protects the soil evidently varies very considerably in efficaciousness.

The thick rain forest will exercize on this the maximum protection and it will be seen how the presence or absence of this type of forest may affect the development of the same land; this protection will be found much less with other formations and that in proportion as the density of the cover decreases, as the plants thin out and as the habitat dries out; as regards crops and plantations, the cover they afford, sometimes most precarious, will depend chiefly on the species, system of cultivation, methods of establishment and upkeep, etc.

Mention has just been made of the influence of the presence or absence of the forest on the qualities of soils of the same origin. A typical instance of the effectual protection provided by the ideal cover constituted by the rain forest (equatorial type) is found at Kivu. According to the geologist N. Boutakoff, to whom we are also indebted for this example, here it is a question of soils derived from the disintegration of metamorphic schists to the west of the border, thanks to the secular shelter of the forest, the soil may be ranked among the best of the regions; to the east of the border, that is, in the cleared zone, the soil long leached and eroded, is poor and shallow with the rock showing. As, in this case, it is not a question of small surfaces, but of areas several hundred thousand hectares in extent, the character of exception or sporadicalness cannot be pleaded and we consider that this example is of real demonstrative value.

It is not without reason that certain investigators consider that only the return to the wooded state—sown tree fallow or natural forest fallow—may restore to the soil the qualities lost and that this should be the formula for the

future; its current practice could periodically regenerate the deteriorated and hardened soils, that is, old soils.

One this subject, here is a small fact observed personally; in many plantations in Kivu, it was remarked that under the cover of large *Erythrina*, traces of the pre-existant savanna, the coffee trees were decidedly more vigorous and more productive than their immediate neighbours; effect of shade supplied by the tree itself no doubt, but probably also the result of a soil enriched and protected by the cover.

Whatever the nature and density of the living cover, the more or less complete protection it assures the soil is nearly always advantageous and never negligible; on broken ground, along the slopes, it becomes absolutely indispensable. If, in certain cases, such a luxuriant cover, even of primary forest, gave a wrong impression of the fertility of the underlying soil, it is very rare, if not impossible, that the total or quasi-total absence of living cover indicates other than complete sterility. Clean fallow and clean weeding, therefore, are the cultivation practices to be rejected here.

Too much advantage must not be taken of the faculty of natural restoration of the living cover, whether it is a secondary forest formation or a fallow weed flora; the short rotations, the too brief periods of rest, harmful at first, afterwards are fatal and in the cover all regressive change, all decrease in vitality are indices of a corresponding diminution in the qualities of the soil.

For all formation as regards living cover, development will only be effected parallel with that of the soil climate, very often in the sense of a more or less marked tendency to drying-up. Atmospheric and edaphic climates being closely connected, it is rather towards a *Pennisetum* fallow that the forest fallow at the limits of the equatorial zone will develop. *A fortiori*, on leaving these limits to advance towards the regions already definitely tropical, it is towards the shrub savanna that the *Pennisetum* fallow will often deteriorate, instead of the expected progression towards forest fallow. This took place in Uganda and was to some extent influenced by the considerable extension in cotton-growing.

Does this mean to say that the shrub savanna has no advantageous effect on the soil? Certainly not, as many species of pyrophyte associations, indigenous or exotic, show as regards hardened and laterized soils particularly a capacity of adaptation and disintegration which makes them valuable as species of preliminary afforestation or for the constitution of artificial wooded fallow land. But they appear rather, by more or less correcting it, to put up with an evil which they have been unable to avoid, as the establishment of the savanna, whatever the type, always implies a variable but certain state of soil deterioration; on the other hand, under the thick cover of closed forest formations, the premature maturation of the underlying soil cannot take place.

(b) *Dead cover.*

This is constituted of leaves, dried grass, plant and animal waste forming a litter and still retaining their primitive aspect to a fair extent. It is already the habitat of certain micro-organisms, bacteria, fungi which begin the transforma-

tion of this waste, but it is also the refuge and food of a multitude of underground animals which stir up and mix this mass with the subjacent earthy layer, which is thus enriched and aerated.

Of the role of dead leaves as a means of returning minerals (chiefly lime) to the soil and the supplementary loosening action which is the consequence, there does not appear to be much known as yet; we presume that both are not in any way negligible.

As regards the general role of dead cover, this has already been indicated in its wide aspects in discussing earlier on the influence of cover, from the ' external' viewpoint, as we said, its ' internal' influence participating very closely with that of humus will be studied further on, it is to the role of this latter that we have to recur.

On the imbibition faculty of the soil, with and without dead cover, the following figures taken from GRANDEAU may be found useful:

Protected soil	soil water = 47 per cent.; subsoil water = 38 per cent.
Unprotected soil	» » = 34 » » » » = 31 » »
1 m^3 moss absorbs in water	2.83 times its own weight
1 m^3 straw absorbs in water	2.75 » » » »
1 m^3 dried leaves absorbs in water	2.33 » » » »
1 m^3 dried fern absorbs in water	2.59 » » » »

The dead cover (dried leaves and humus) on one hectare, which weighs 7,000 to 8,000 kg., can absorb before saturation point 5 to 9 times its weight of water, therefore, 35,000 to 72,000 kg. water.

As regards similar Congolese material, would the imbibition faculty be less? We believe that it would at least be equal; but, even with a slight coeffiient of reduction, these figures would not be any less edifying.

Between the Tropics, owing to the special conditions of heat and humidity, the dead cover is transformed and disappears very rapidly; it only accumulates in rare areas, through lack of heat (high altitudes) or air (excess water) and again it is necessary that erosion does not intervene...

In most cases, the destruction of the dead cover is due to multiple causes, the chief of which are heating, run-off, periodical fires, spontaneous or of anthropic origin, not to mention termites; for vast territories, undoubtedly this latter cause is not the least, also in the wooded savanna of Katanga, where the extent of termite activity can be perceived from the number and size of the termitaries, the endless network covering the surface of the soil and at night from the noise of an incessant labour, comparable to the sound which the projection of milliards of grains of sand would produce.

In this respect, diverse cultural practices are also to be blamed, among which mention may be made of excessive burning after clearing, burning of weeds and stubble practised by the natives, too numerous superficial methods and the absence of shade against prolonged insolation; the use of forest undergrowth for litter and compost and of top soil for fertilizer is not yet customary in the Congo,

but there is nothing to the contrary that this will still be the case when the requirements for compost materials will increase. We will treat brush fires apart; in many instances, there is great controversy as regards their harmful action; in the combustion of dead cover, however, this would be difficult to deny.

The effect of this cover is recognized and from this was derived the practice of mulching which re-creates an artificial cover more or less efficacious and similar to the other, according to the type of material employed, thickness of the layer, its persistence, etc.

4. — HUMUS.

By extension of the sense, the name humus has sometimes been given to the whole of the organic mass, decomposed or otherwise, buried in the soil; however, to be exact, such an appellation implies for all the matter in question, appreciable and preliminary modifications in volume, texture, even composition.

On the other hand, in the strict sense of the word, humus or rather the colloidal complex of the humic compounds is a residue formed solely of carbohydrate products, already difficult to decompose, although capable of being gradually destroyed; as such, it does not contain or no longer contains nitrogenous organic compounds, condition which is hardly ever seen except in certain special cases.

Likewise, it is not this form still badly defined and a little theoretical of humus that is our object, but rather the mould which represents the total organic substances of the soil, in course of decomposition in the presence of air, diminished by the losses due to fermentation (N, CO_2, etc.) and solution (mineral salts). However, we will keep the name humus as being that most generally employed.

Humus is formed at the expense of the dead cover and contributions of organic matter of plant origin (green manures, compost, etc.), even animal (excrement, etc.). Its most frequent and also most active form is mild humus, although in certain cases an acid humus is elborated, fairly different from the former and usually produced in an environment deficient in heat, water or oxygen. This is equivalent to saying that the production of mild humus, under proper determinate conditions, necessitates the cooperation of these three factors, combined with the action of microrganisms the presence of which, moreover, is the function of the said factors.

Previously, in regard to soil climate, we wrote that humus exercised on it an essential influence, in this sense that it is exceptional, if not impossible, for a soil poor in organic matter to enjoy a favourable climate; what has just been indicated, on which the production of good quality humus depends, shows that in its turn, this production necessitates, besides an abundant supply of well decomposed matter, adequate conditions of temperature, humidity and aeration of the soil.

In view of the character, on the whole fairly exceptional of decomposition in an anaerobic environment, of much lesser intensity and besides less susceptible to thermic variations, it is to humification in aerobic soils that the following considerations apply.

In these soils, it seems that, of the three factors mentioned, it is the temperature which has the most marked action on the nature and rapidity of decomposition, that is, definitely, on the quality and especially on the quantity of the humus produced. In this respect, according to the conditions of heat of the environment, a preliminary selection takes place, as already mentioned, between fungi and bacteria; these are the true agents of the decomposition in most of the Congolese soils, because on the whole, they are better adapted to this fairly diversely hot and humid environment; it is their preponderant activity which justifies to a large extent the prompt disappearance of the dead cover and the frequent low content in humus.

Humification determines, to the benefit of nitrogen, a relative reduction, since the ratio C/N, which is usually from 30 to 33 in the initial organic matter, falls to the very favourable average rate of 11 (between 10 and 15) in the final product (1); with an equal quantity of carbon, the bacteria assimilate here, in fact, proportionately more nitrogen.

Save for the intervention, fairly frequent moreover, of supplementary causes of the loss in organic matter, it is the average temperature of the soil which regulates the course of the process of the production and destruction of humus: below 20° C., the first prevails definitely over the second; between 20 and 30° C., destruction tends to equal production; beyond 30° C., there is an endeavour to establish a state of equilibrium between the two phenomena, destruction compensating production all the more rapidly as heat increases.

In this respect, the observations of H. Scaetta on the soil of Tshibinda (Rion) appear to us significant:

Altitude	2,115 m.
Temperature of the soil at 15 cm.	17° C.
Thickness of mould layer	20 cm.
Humus.	2.2 per cent. (2)
Plant waste	21.4 per cent.

In areas at an altitude of at least 2,000 m., there should be a deep layer of plant debris and humus, however, the destruction or impovrishment of the living cover, the consecutive run-off and erosion, check humus formation after having destroyed the pre-existent deposits.

If these data are added to another fact already mentioned, namely, that the intensity of chemical exchanges and biological activity is doubled by an increase in temperature of 10° C., all the importance of cultural and other practices which

(1) Both in the initial material and in the final humus, the C/N ratio may be lower or higher than the average figures indicated; the more or less woody nature of the initial material plays, in this respect, a very important part.

(2) A soil is considered as humic, if containing 10 per cent. humus.

contribute directly or indirectly towards reducing waste of humus by reducing heating of the soil and the losses through surface leaching.

From the viewpoint of rapidity of decomposition GRANDEAU compares, the following plant material:

This rapidity is greater for soft, tender and sappy parts than for the dry, hard ligneous parts; in the same way, for green leaves than for dry and dead leaves; for straw, rushes, reeds than for wood; for nitrogenous matter than for non-nitrogenous matter; for unprotected organs than for the waxy, resinous, sil cious parts; for the parts without tannin than for these containing tannin, the deomposition of which necessitates much oxygen; for plants rich in potash and calcium than for plants or parts of plants poor in these elements.

As regards the role of humus, we will limit ourselves to recalling briefly that it is on this that chiefly depend the grumous structure of the soil, as well as its capacity of imbibition and retention; that its disappearance involves that of the subterranean microbial life and that it is the indispensable corrective of excessively heavy and cold soils and of those which are too light or which heat too rapidly. It is pre-eminently the element of cohesion and stability and, consequently, of fertility, which should not be confused with mineral richness, since without humus, this latter can never be anything but potential. More so, an organic restoration could sometimes attenuate a deficiency supposed at fiirst of a mineral order, in certain elements at the very least and for as much as the reserves of the soil might compensate losses.

Until lately, the prodigious fertility of colonial soils, their inexhaustable reserves of humus have been spoken and written about as abundantly as erroneously. Certainly, this illusion no longer exists and what has just been noted on the preponderance of bacterial activity proves that, without exception, this fertility and these reserves are but a myth... another added to those of the legendary virgin soils so greatly vaunted; because the soils of really hot countries, even not excessively so and fairly humid, are rarely found to be rich in humus, while these same soils become poorer and poorer in this element as the area becomes drier or if it is put under cultivation. It is known why it cannot be otherwise.

Certain soils of Java (virgin forest) show humus contents attaining 27.4 per cent. (Lembang), however the average is between 1.7 and 2.7 per cent.

For the central basin, where the most favoured of our equatorial soils in this respect are to be found, according to the different investigators, regions and types of forest, figures are given varying from 1.2 to 1.9 per cent., but it would indeed be highly optimistic to think that the average lies between these two figures, which appear to us to apply to particularly humiferous soils [1]. According to us, the following indications give a more modest and undoubtedly a more exact conception of the current content; many forest lands do not contain over 0.3 per

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[1] BEIRNAERT, in a recent study, reports that the proportion of humus in the forest soil of the Yangambi, determined by the permanganate methcd, varies from 1.25 to 1.29 per cent. in the layer 50 cm. deep. Expressed in weight, this content corresponds to approximately 100 tons of humus.

cent., others, already considered as good cultivable lands do not exceed 0.5 per cent. (3 kg. humus per m³ or 30,000 kg. per ha.) and at about 0.9, 0.8 and even 0.7 per cent. it is frequently recognized that the soils in question are of very good quality as regards richness in humus.

Clearing, preparation for native cropping or plantations, the majority of the cultivation so called maintenance methods have resulted in destroying a considerable proportion of the humus in the soil [1]; to these are added the aggravating factors already indicated—burning, insolation, clean weeding, unchecked erosion—and others, such as an agricultural system not properly adapted to the climate, the absence of cover or shade in a pluriannual crop which does not cover the soil well, use of too wide spacing, etc.

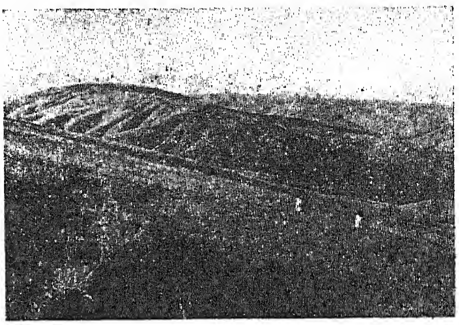

FIG. 1. – Denuded aspect of certain mountains of Kivu.

(Photo H. Scaetta).

We have read that a land cleared and burned, then covered with a legume subsequently only showed a loss in humus of about a sixth of the initial content; moreover that, complete clean weeding for more than three years had reduced this content to a third and that a plantation of some ten years, without a leguminous cover, had lost approximately half of its humus. One would wish that it was thus everywhere and always, but very frequently alas the losses are very much greater, in the case of clearing followed by burning, for example.

Up to the equatorial forest, organized source of humus, which has been overpraised, the enormous reserves of humus which were freely attributed to it were usually found to consist of a layer of a few centimetres. Even in the mountain forest, at about 2,300 m. (approximately 16° C.), the deposit is not what would have been thought; the less dense cover, the thinner forest stands and the greater slopes probably favour some erosion. This does not hinder the fact that, for the agriculturist, the behaviour of forest soil supplies much valuable information and that an endeavour should be made to reproduce its conditions as far as possible.

If such is the actual content of equatorial soils, what about that of tropical soils ? Their very different conditions make it difficult to advance average figures; however, it is certain that the humus content is fairly low and that it decreases rapidly. In some savanna soils, a superficial deep coloration may deceive an uninformed investigator; in our opinion, it is frequently due to ash residue produced by former fires.

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[1] At Yangambi, at an altitude of 470 m., it is estimated that each month of denudation after felling the forest destroys nearly a ton of humus.

In another study, we evaluated at about 15 tons per hectare the average quantity of organic matter which would have to be restored to compensate the annual loss in humus of Congolese soils in the case of shrub or tree plantations giving the land proper shade. Important though it appears, this loss may be appreciably higher in some hot habitats destitute of cover and where the rainfall is poorly distributed.

By way of information, it may be recalled that the humus content of our best Belgian soils approximates 3 per cent.; this evidently due to the regular and abundant application of organic fertilizers and also to a climate with which destruction is relatively slow.

From the above data, it is possible to estimate the essential importance of the part played by humus; particularly from the physical and biological aspects; it is towards conserving it or to restoring it that a comprehensively planned cultural technique should tend.

II. — Characteristics of Congolese agriculture as regards the soil

It should be pointed out first of all that fertile lands are relatively rarer in Africa, particularly in the Congo, than in Europe.

1. — Native crops.

The general impression was that the natives farm without any system, without any well established rules in a happy-go-lucky way; nothing is more inexact. Perhaps it was so some centuries ago, that is, before and during the period which saw the introduction and progressive propagation of field food crops which constitute the basis of the present native agriculture.

It is difficult to specify when rice, sorghum, millet, Eleusine and the banana came from Asia, while maize, cassava, sweet potatoes, groundnuts and beans, of American origin, in Africa date back to at least five centuries; these last five plants especially, won an important place in the Congo and it is certain that the agricultural methods adapted to each were only found after much groping and many tentatives, as also the cultivation methods and systems which, through and on account of them had the soil as object.

The ensemble of the rules thus traditionally established and the choice itself of the plants cultivated were the result of a slow adaptation to the ecology of each region, in close correlation with the characteristics and requirements suitable for the people concerned.

(a) *Former régime.*

Up to European occupation and even during the first half of this, subsequently to the primitive period when plants and other food products were gathered as found, the economy of agriculture was blocked or nearly so; the statics of the soil are practically balanced, most of the products of the land being consumed *in situ.*

Few cultivated species; these are grown solely for food purposes and are mostly annual or biennial; one main plant forms the basic food and enables some changes.

The exhaustion of the soil necessitates preparing new fields and abandoning the old plots to spontaneous vegetation; cultivable virgin land is not lacking, but various reasons prevent the excessive spreading out of the village crops; after a more or less long rest period, the former fields having regained their fertility are reoccupied. Fallow becomes a common practice and besides none other would be better adapted to such an environment, from the ecological, ethnic and economic viewpoint. This culture could be called ultra-extensive if the European concept were applicable.

(*a*) So called Bantu system.

This is a veritable cultural cycle sprung from and well adapted to the climate and soil of the rain forest, but of this only. If it is duly forestal, the name 'Bantu' is, on the other hand, only partially justified, as the numerous peoples of this race living in the savanna country, to the South and South East of the central basin, do not practise it and for a very good reason. On the contrary, the Bantu tribes previously established in the savannas of the North and driven back into the Basin by the Sudanese invasions, adopted the system with their new habitat.

The principle of this system lies in the restoration of soil fertility by replacing forest trees producing humus and this previous to all putting back into cultivation; the *sine qua non* condition of its efficacy and perenniality is a rotation of a duration sufficient for the semi-hard species of intermediate character and with denser cover, following the white woods of the first regrowth, to arrive at completely renewing the condition of the stand. According to position, the interval between two successive clearings may vary from twelve to twenty-five years; felling is rarely complete, burning is fairly moderate and generally after four or five years (3 or 4 crops) the land is abandoned to forest fallow.

This, however, is the most advantageous and, even in the basin, shorter rotations are frequently noted; but, on the borders of the basin, where the typical equatorial climate no longer prevails, the behaviour of the soil differs, the vitality of the forest formation diminishes, the more accentuated relief augments erosion and the rotations which should be longer, become shorter owing to the lower productiveness of the land. The regression of the soil cover and the soil soon break the cycle and prepare the way for the savanna.

(*b*) Savanna system.

This system is adopted in the savanna regions which extend both on the border of the central basin and in the southern part of the territory, from 4° parallel, in other words, in the zones with tropical soils and climate. Properly speaking, the peoples established here do not practise any true crop system, as on these lands which the atmospheric climate maintains in a state of unstable ba-

lance, the action itself of the factors which govern their transformation confer on it such an irregular trend that practically no rotation can be effected and the selection, situation and even the duration of the crops depends on a more or less early or late restoration to fertility.

Under shrub or grass fallow—of these the *Pennisetum* fallow is one of the best and, to a certain extent, as good as certain well-thicketed savannas—this return to fertility is always a relative and precarious matter, so that after some score years of occupation—not necessarily under cultivation—the land has to be abandoned and the village shifts to a new site and new lands sometimes fairly distant.

While the area of extension of the forest system coincides fairly well with the zone where cassava predominates—nevertheless the second extends into the first—in the savanna regions, cereals are the chief food crops (maize, sorghum, millet); the non-seasonal reserve crops, less susceptible to irregularity in rainfall, are in the minority. It is precisely in these regions that climatic changes are to be feared, as the soil is less fertile and erosion more marked, it is not surprising therefore that periods of scarcity are relatively frequent.

A separete category will be made of low-lying and fresh alluvial soils, which preserve their humus and qualities owing to exceptional conditions of moisture; their soil, their flora and their general aspect, moreover, contrast definitely with the surrounding savannas. Except in the fairly frequent case of excessive moisture, they are greatly in demand for farming and consequently, densely populated.

In regard to the forest system, we stressed its well established character of crop cycle; in its own environment, the equatorial rain forest would last indefinitely without external causes intervening and upsetting a naturally stable equilibrium.

The cultivation methods of the *Sudanese* peoples in the North of the Colony, on the contrary, follow a *discontinued system*; wherever these people settle, the forest disappears never to return and the savanna follows, as the characteristic of these methods is to exhaust the fertility of the soil through clearing repeated at short intervals; this repeated clearing precipitating the regression of secondary formations does not allow the land any possibility of regeneration. In this respect, mention may be made of an example already cited many times: with the Bwaka of Ubangi the widespread cultivation of maize left, in place of the forest, enormous expanses of practically sterile savanna under *Imperata cylindrica* Beauv.

The Sudanese discontinued system presents several analogies with the system of the mountain people of the East, at least as regards its consequences on the soil. Without, in this case, soil exhaustion being deliberate, exhaustion nevertheless takes place through intensive erosion which rapidly sterilizes the cultivated slopes and makes inoperative the weak reaction of spontaneous vegetation during fallow; as the process of deterioration continues at an accelerated rhythm, the subjacent rock soon appears and the arable soil is irreparably lost; frequently the disafforestation of the slopes, even partial and old, prepares

the way for destruction. Such a situation is complicated still further by the fact of an usually fairly dense population and the existence of an excessively large livestock constantly requiring shifting to new pasturage. It is seen, therefore, that the co-existence of the discontinued system with the semi-pastoral system does not simplify the soil problem in the uplands of the East.

Undoubtedly the cause must not be sought elsewhere of the great migrations which, from the savannas of the North, North-East and South-West, formerly advanced to conquer the forest soils of Central Congo.

(b) *Present régime.*

The development of the economic working of the country and in particular the means of communication, the establishment of important administrative, commercial and industrial centres, the demand for export products (cotton, coffee, etc.) stimulated native agriculture and brought about disturbances the full importance of which is not yet fully realized; they are the counterpart of the appreciable and immediate advantages the people obtained through this new trend.

No more than agriculture under the old régime could be qualified as ultra-extensive, can it be said that under the present régime it is extensive or intensive; as regards the soil, the harmonic apportionment of cultivated fields and crops, there is considerable disturbance; the long and indispensable rotations are no longer possible, the regression of fallow flora begins and the fertility of the soil diminishes more and more rapidly.

In the forest regions, the cultural cycle, safeguard of the soil, tends to give way to the discontinued system; in the savanna region, this latter become even more discontinued. The introduction into the normal rotation, together with cotton, of export food crops (groundnut and maize) by increasing present production is not of a nature to facilitate the solution of the problem in the future. It is necessary, therefore, in this case, to make a greater effort than formerly to find a practical solution for the restoration, firstly organic, subsequently mineral, of the soil in order to remedy the balance of the soil in which the disequilibrium increase with the exports. Otherwise, it will be necessary to continue, according to position, either by dispoiling the everlasting forest, provider of humus, or by 'living off the capital' in prematurely occupying the reserve lands; the result can be easily imagined, but before it is too late, the alarm must be given and everyone made aware of their responsibilities.

2. — EUROPEAN CROPS.

For the greater part, these are shrub and arborescent species—oilpalm, coffee, cacao, hevea, cinchona, tea—all pluriannual plants for which, consequently, the choice not only of the soil but also of the subsoil is particularly important.

The first Europeans who undertook to establish plantations in the Congo were misled by the luxuriance of the vegetation and believed in the inex-

haustible fertility and unlimited productiveness of the soil. Imbued with preconceived ideas and ready-made formulae and besides of too recent a stay in the country, they had not been able to observe sufficiently the agricultural methods of the natives, including the forest system, to discern the information and warnings they contained.

On the other hand, the red colour, so frequently seen, of the land was interpreted, it is not known exactly why, as an index of fertility and it took a long time to correct this erroneous opinion. Evidently there was no question of protecting the soil and, with still more reason, to consider the eventuality of soil restoration. In the case of equatorial soils, there was no suspicion that the fertility produced by the forest could disappear with it, and that burning, then insolation and erosion could so rapidly exhaust the layer of humus and impoverish the soil; as regards tropical soils, for fear of difficulty in clearing, preference was often given to lands having a herbaceous cover and, in many cases, they were subsequently found to be leached, deteriorated, of little depth and consequently actually costly as regards preparation and upkeep, while at the same time only giving mediocre yields. Furthermore, sometimes the area cultivated was not proportionate to the capacity of the farmer.

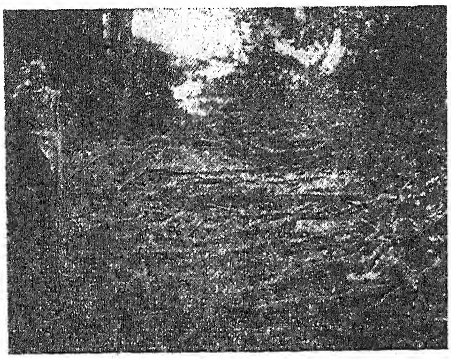

FIG. 2. – First effects of erosion through run-off. Path in the forest of Ile Idwji.

(*Photo H. Scaetta*).

As regards cultivation methods more particularly affecting the soil—mention has already been made of the harmful character of some of them—for a long time they were a not very fortunate combination of poorly adapted native practices, Europeans methods of no purpose and foreign colonial techniques hastily applied. Gradually, however, a selection took place, result of the failures of some, the patient investigations and observations of others and certain rules were progressively established and a discrimination made in regard to the treatment of equatorial soils on the one hand, and tropical soils on the other.

While, however, these early tendencies relative to the soil itself were manifested, a vigorous evolution was proceeding in other branches of the cultural technique: improvement in planting material, improvement in upkeep methods and the sanitary protection of crops, the bringing up to date of methods of harvesting, preparation and processing of the products.

The results obtained are more than encouraging and make it possible to anticipate within a fairly short time, yields quantitatively and qualitatively better. However, these yields characterizing an already intensive agriculture will only be possible, or at the very least durable, so long as sufficient progress is made in the treatment of the soil which constitutes the basic factor of the culti-

vation technique, to compensate for the dangerous delay which is evident when compared with the other above-mentioned branches.

No substantial results can be obtained in this case without having as foundation ' soil scence' and the effectual protection of the soil against causes of deterioration.

III. — Deterioration of Congolese soils, its chief causes and certain aspects

Soil deterioration is expressed by an increasingly marked decrease in its qualities, chiefly the physical characteristics and, in consequence by loss of stability, structure and fertility.

The detailed discussion of the process of deterioration, its physico-chemical mechanism, does not come within the scope of this article; besides, there are many excellent and comprehensive works on the subject; moreover, the causes of the phenomenon have already been clearly indicated in the preceding chapters and will now only be briefly recalled.

In fact, their action on the soil may be summed up as heating by direct insolation, whence bacterial pullulation and increased decomposition of organic matter —run-off and consequential erosion, whence mechanical denudation of valuable elements (humus, silt)—loss through dissolving (leaching by rain) of the exhangeable bases, whence impoverishment and acidification; these three influences combined involve the appearance of a fourth factor, the decrease if not the complete disappearance of humus reserves.

Thus, the following causes, by provoking the coming into action, either isolated or simultaneous, of these four factors, involves *ipso facto* the deterioration of the land:

natural insufficiency in depth and cohesion of the soil;

existence of points of lesser resistance where erosion starts and spreads;

absence of protection against persistent winds which increase surface evaporation, dry and scour the soil;

systematic practice of brush fires;

notable change or suppression of the plant cover, disafforestation of the slopes;

too short rotations and inadequate organic restoration;

putting slopes into cultivation without any protective measures and, in general, all unsuitable cultivation practices and methods (monoculture, predominance of root crops or high altitude plants, excessive top working, absence of shade, clean weedig, etc);

excessive herds of livestock, particularly goats;

population too dense.

This list is but an example and is not in any way limited; nevertheless, without losing sight of the fact that these different causes of deterioration are also more or less connected with the climatic factor, one cannot but be impressed by the important part played by the anthropic factor. Probably it is only in definitely unfavourable situations that the influence of the first is preponderant, when it

is a question of an abnormally dry, even semi-arid area, or where the rains are very abundant but particularly badly distributed (supposed case of a fall of 2,000 m. comprising frequent storms with heavy downpours and a dry season up to three months); further, the preliminary intervention of the second factor is necessary.

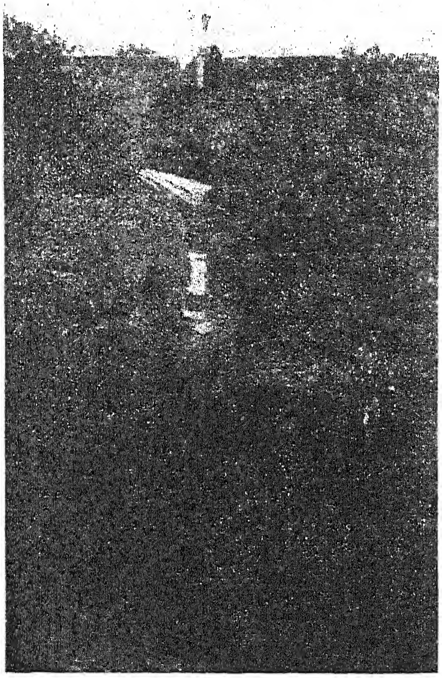

FIG. 3. – Effect of erosion in the environs of Elisabethville.

(*Photo Ch. Seydel*).

Among the causes of soil deterioration, erosion is one of the most active and the most liberal; as it is also the most insidious, supervision and control measures cannot be abated for an instant.

As regards the well known phenomenon of laterization which characterizes the tropical climate, it is both the agent and final limit of soil deterioration. Knowing the age of the soil is indispensable as, according to the stage of modification, it reacts differently to the treatment applied; thus, contrary to young soils not or barely laterized, old hard soils in which lateriztion is already well advanced, are hardly profitable and difficult to improve; an onset of laterization, which must not be confused with reddening, may sometimes suffice to slacken the gaseous and water exchanges and consequently to reduce fertility appreciably. It may be noted that the plant cover delays aging and it may be recalled that certain tree species of the savanna possess, as regards the lateritic socle, a marked disintegrating capacity.

The two phenomena, erosion and laterization, by their very importance, merit more than just a simple mention; but, besides the fact that a necessarily too succinct review would not attain the aim in view, we are obliged to keep withn certain limits and we refer the reader to the studies dealing specially with these questions and in particular, the execution of suitable control measures.

Deterioration attacks preferably lands used for agricultural purposes, cropping or grazing, although wooded land is not exempt, far from it; in fact, it is soil deterioration which is the initial cause of the regression of secondary formations and which most frequently decides the success or failure of re-afforestation work, in which besides, many measures aim at remedying the harmful effects of this same deterioration.

The wild flora usually comprises some species, the presence of which may give a more or less exact idea of the condition of the soil and European foresters

are perfectly aware of the meaning of the appearance of black whortle-berry (*Vaccinium myrtillus* L.), then heather (*Calluna vulgaris* Salisb.) in a stand.

The same in intertropical regions and, in this case in the Congo, very useful indications can be obtained from the examination of the vegetation.

The agrostological flora, its specific and social composition, indicates the extent of deterioration of the soil; it is also known that if bracken (*Pteridium aquilinum* (L.) Kuhn)—in high-lying habitats—and the false sugarcane, elephant grass (*Pennisetum purpureum* Schum.)—in lower-lying and warmer areas—colonize lands, it is because they have been cleared fairly recently and still possess certain qualities, particularly freshness.

Among the field plants, even ruderary, there are some which are considered as furnishing fairly conclusive indices in regard to the extent of deterioration, as loss of soil fertility; apart from *Imperata cylindrica* Beauv., which we mentioned earlier on and to which we will return, we will cite a few, some of which seem to be more peculiar to high-lying ones:

Cynodon dactylon L. (Bermuda grass) is rather a cosmopolitan species which characterizes soils definitely impoverished and deteriorated for want of humus;

Bidens pilosa L., which establishes itself on slightly deteriorated soils;

Commelina sp., a climbing Commelinaceous plant difficult to eradicate, which spreads over land still having some reserves of organic matter, but insufficiently aerated;

Galinsoga parviflora, index of a relatively humiferous and fairly fertile soil.

It is evident that the natives knew of the existance of this indicatory flora and its signification, in regard to exhausted crops and old fallow land among others.

In many of the Congolese regions, typical cases of soil deterioration are not wanting, many of which have already been mentioned:

lands originating from metamorphic schists, leached and impoverished through a long period of disafforestation;

intense erosion of denuded slopes and consecutive warping of the tributary valleys, whence the formation of extensive perennal papyrus marshes;

cultivation of native food crops on steep slopes, ruined after three years (South and South West Bashi);

premature deterioration of cotton fields in Uele and certain European coffee plantations at Kivu and Ituri;

organic deficiency of different maize lands at Ituri and consequent fall in yields;

transformation of unproductive *Imperata* savannas of vast forest cantons in the chieftaincy of the Bwakas (Ubangi) through the cultivation of maize according to the Sudanese method;

case of many stands of eucalyptus, woods 'without shade', established under a climate too definitely tropical and where the soil scarcely sufficient at the beginning, remains without humus, progressively dries up and becomes sterile, owing to the inadequate cover and specific influence of the root system.

We consider these few examples sufficiently conclusive to make comment superfluous.

IV. — Necessity of maintaining and, if possible, of increasing the fertility of the land at present occupied and of husbanding the soil reserves for the future

There are reasons for this necessity common, if not to all, at least to most of the countries situated, like our Colony, between the two tropics, and also others more specifically Congolese.

The first derive from various considerations already mentioned, to which may be added the following, also of a general order.

Seeing that, for want of being protected and maintained, the fertility of colonial soils is unstable and transient, it is necessary for all users, whoever they are, to employ every care and avoid all misuse.

Here we refer more particularly to native agriculture, not certainly, that in this respect the methods of the European planters give every satisfaction, but because the native growers are by far the majority, since for one hectare occupied by the whites, the crop and fallow land of the natives covers some seventy-five. All progress accomplished by the natives in the sense of an increase in and prolongation of the productiveness of the soil—this can only be the consequence of an educative work of time on the part of the government agronomists, different technicians and settlers—will be marked by a gain, the immediate and remote results of which will always be appreciable. It goes without saying that such an evolution would be subordinated and aided considerably by the example of the results of the European technique.

At present it can be seen that there is a veritable squandering of the land, more unconscious than deliberate, through the effect of the cultivation methods and systems already described, added to the present trend in production.

Perhaps there would be a tendency to think that the consequences are not very serious, taking as argument the fact that the colonial soil is more active and can give higher yields, since its productive capacity in a given time is greater than that of the soil of the temperate regions, owing to the greater rapidity in plant growth.

Example: – maize: 3 months as against 5 months; tomatoes: 3 months instead of 5 months; beans: 2 months instead of 3 months (Chenon).

This is only apparently true, because, on the one hand, the possibility of obtaining two crops a year on the same field is far from being the rule for all lands and for all crops, chiefly owing to check in rainfall (one or two more or less long dry seasons); on the other hand, the important researches of C. J.J. Van Hall show that the yields of temperate countries are superior to those obtained in tropical lands. The study of the many figures cited by this author enable us to make the following comparison, the average yields of the temperate zone being evaluated as 100.

If, in the determinate positions we have indicated, the equatorial soils still resist relatively well, this is not the case for tropical soils which are really menaced. The climatic conditions necessary for lateritic formation exist and the

anthropic factor accentuates and accelerates it the more definitely tropical the environment causing all the more damage the more marked and nearer to the surface and more extensive laterization and the greater the area.

For each zone, average of five countries with highest yields, per cent.

	Temperate zone	Tropical zone (1)
Rice	100	52.1
Maize	100	36.0

Greatly influenced also by anthropic action and closely associated with the chief forms of soil deterioration, erosion ceases to be a local occurrence of limited range, but acquires the proportions of a general phenomenon which profoundly modifies the living conditions of vast regions; for this reason, erosion plays a most important part in human ecology and involves social consequences which may be extremely serious.

Before examining the social side of the question, let us first mention the economic aspect, equally important, the obviousness of which dispenses us with lengthy explanations. The decrease in productivity of the soil has as corollaries, the fall in yield, the necessity of extending clearings and that more frequently, which results in a loss in work output and in nutrient matter, as well as a rise in production costs.

This social side of the question blends exactly with the more specifically Congolese aspect of the problem to which we have just alluded.

For many years, the Government of the Colony has justly carried out an extensive campaign for the control of serious endemic diseases, infant mortality, etc. This important work, which aims at raising the standard of living of the people, cannot, however, be of a sanitary order only; it also implies the necessity of assuring them a better alimentation and, to do this, it is necessary, in the first place, to maintain the fertility of the lands at present occupied and to safeguard the reserves of virgin land for the coming generations; of this reserve, the present generation uses only that which is strictly indispensable and must be sparing in its use.

As it is probable and desirable that an appreciable increase in the native population, already the case in Kenya and in South Africa, will take place fairly soon in the Congo, it is advisable henceforth to give attention insofar as regards cultivable land, to the increased demands which this rise in population will necessitate; *ipso facto*, local famines, always possible, will be prevented and, by increasing the area under food crops, even with the introduction of plants, the present food regimen can be progressively improved by making it more abundant and, in particular according to region and position, less deficient in fats or proteins.

(1) As the author understands it, this zone comprises both the equatorial and the tropical soils.

V. — Measures suitable for preventing deterioration, for checking progressive loss in fertility and for reclaiming soils not excessively deteriorated

'Prevention is better than cure', according to the proverb. This is particularly true in this case, because if destruction is rapid, regeneration if still possible, is always long, difficult and expensive.

In fact, all action may be reduced to: Protection of the soil to maintain its freshness, its humus content and, consequently its grumous structure; when this is endangered, endeavour to restore the original content and freshness. Protection against direct insolation and the erosive force of rains by a top cover and shade; against run-off by the construction of ditches, hedges, terraces, blind drains, etc., and by the upkeep of the organic richness of the land, necessary for its porosity and retentiveness.

In India, it was found that the results of good agricultural methods did not differ from those obtained with poor methods when effectual measures were not taken against erosion; but methods which do not take erosion into account, can they be qualified as good ?

In this chapter, the different measures which can be carried out to maintain soil fertility will be enumerated; according to position, the methods necessarily vary and sometimes the same process has to be modified if circumstances so require; we will but indicate in the main the principal theories or methods in question.

The measures to be taken are preventive or curative; the former tend to prevent deterioration, while the latter may aim, according to circumstances, either at checking loss in fertility already in course, or at regenerating certain soils in which the degree of deterioration is not yet too pronounced; beyond this stage, afforestation for the purpose of regeneration may become necessary, the land no longer being farmed either temporarily (wooded fallow) or permanently.

Preventive measures.

These are legal and administrative or technical.

In the first category come certain prescriptions of forest legislation (establishment of reservations, prohibition of disafforestation of the banks of water courses, round about fountains and of slopes with a gradient of over 35°), which, however, as regards the soil, only perform an indirect protective role; their efficacy depends on that of the supervision exerted and the penalties applied.

One administrative measure merits attention; it consists in declaring closed to European occupation certain chieftaincies or parts of chieftaincies where the shortage of cultivable or grazing land is to be feared; in itself, this decree is logical, but it is also dangerous, because it is sometimes taken rather prematurely and, like all facile formulae, retards the issue without preventing it; the danger lies chiefly in the systematic application which tends to be made *a priori*.

In the case with which we are dealing —there are others similar—it is a question of a part of a chieftaincy situated in a high-lying zone (extreme disaffo-

restation and erosion), with a dense population (about 140 capita per km²) and with a fairly large number of livestock, chiefly cattle. According to A. W. THOMPSON (1), under such conditions the soil is endangered, unless, however, erosion is controlled, all further clearing of the woods by the natives is prohibited, the annual burning of the grazing lands is regulated and compost and fertilizer are used; this is to say that the decree taken cannot but be inoperative and will always be so whenever the measures regarding a menaced soil will only be limited to the making of laws, particularly in the case of mountainous regions, densely populated where the semi-pastoral system is practised.

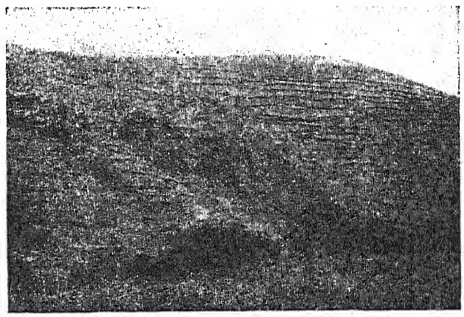

FIG. 4. – Sloping land arranged in terraces by the natives of Kivu in order to prevent slipping of the soil.

(*Stereotype plate of the Belgian Royal Colonial Institute*).

In our opinion the solution of the problem is primarily cultural; it depends on the agricultural or forestal technique employed and more especially on the progress to be accomplished in the matter of soil protection; most of the other methods, if not all, are only palliatives, their effect can only be temporary and, in short, inadequate.

In similar cases, however, to obtain in the areas concerned—we are thinking of the European settler as well as the native grower—lasting and durable results, the aid of the powerful levers, instruction and propaganda, are necessary.

In the case of the whites, the progress obtained at the research stations and services will be made known by means of pamphlets and other printed matter, by word of mouth and, better still, through practical examples; advantage could be taken of demands for credit or subsidies to impose the adoption of the technique advocated. With the natives, action can be taken through advisers, through the funds and agricultural associations of the chieftaincies, agricultural educational centres, etc., and it will be useful to bear in mind the methods that proved their value at the time of the educative cotton propaganda, not forgetting... necessity, which will be a still more convincing argument.

An important step in this direction will be taken when farm work will no longer be considered by the men and particularly the young educated natives as something to be despised; it is much to be feared, however, that female labour in the fields, practically a synonym of slave labour, will remain a fixed tradition.

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(1) THOMPSON, A. W.:

Sparse population: up to 150 inhabitants per square mile.
Medium: from 150 to 300 inhabitants per square mile.
Dense population: over 300 inhabitants per square mile.

Let us examine the technical preventive measures, those of the second category.

It has been stated that it is not desirable to decree the general application of a given method; it is preferable to select a method for each region in question after a preliminary study of the situation. Only one measure can be generalized without any danger, that which assures best the conservation of humus.

In a previous report, we wrote about the pressing need of adopting a policy as regards organic matter, of undertaking a veritable humus crusade; we confirm this opinion in every way.

As regards other measures, this is a local matter and their adoption depends on environmental conditions, as was pointed out earlier on; thus protective methods may differ, according to whether they concern equatorial or tropical soils and even though they are based on the same principles.

FIG. 5. - Young cinchona plantation, terraced (Kivu).

(*Stereotype plate of the Belgian Chemical Union*).

The determination of soils suitable for forestland and those suitable for farming would, in many respects, be most important; to the first belong land which must absolutely remain under forest, but also land which, owing to its nature or state and notwithstanding all protective measures, cannot be used for agricultural purposes.

In our opinion, it would be as well to improve and encourage the forest system (cultural cycle), but only where it is really suitable, that is, in the *Congolese Basin*, typical region of equatorial soils; the density of the population is low, the rate of afforestation is high, and there is no disadvantage, quite the contrary, in being liberal, although not excessively so, in the concession of land to be cleared; the longer rotations, by prolonging the productivity of the soil, will assist in protecting the forest. Under such conditions, the duration of rotation being twenty-five years (quinquennial rotation including two years of cassava), for the maintenance of 200 inhabitants of a village, the crop cycle would require a minimum area of 1,000 hectares of forestland.

A moderate forest system, of the type practised by the Nkunku in Lower Congo, would undoubtedly be suitable for certain fertile savannas, where the progressive trend of plant formations would be stimulated.

By means of drainage and even irrigation works, probably it will be possible to reclaim large areas of cultivable land. However, the best reclamation always consists in the benefit obtained through the protection or judicious treatment of the soil; in this respect it may be noted that an uninterrupted succession of crops which leave the soil exposed (maize, cotton, etc.) is most pernicious and that catch crops giving a good shade (groundnuts, beans) are necessary.

There should also be a tendency towards mixed farming, in which vegetal and animal production, cultural and zootechnical practices are on a par and are combined, forage being produced —at least in part—in exchange for manure; if not sufficient for cattle, other animal breeds or races could probably be substituted.

Wherever livestock is super-abundant, the number of head should be limited and the composition of the herds modified; in short, effect a mass selection by eliminating old animals, poor specimens and excess males; the pasturages will be managed to the same extent without reducing yield. Small cattle will preferably consist of sheep, goats and pigs.

Curative measures.

As has already been mentioned, these respond to two specific requirements, often, moreover, connected; this is to say that checking loss in fertility already in progress constitutes, in fact, a first step in regeneration; reciprocally, to restore a soil capable of being improved, it is necessary first to eliminate all causes reducing its fertility.

The curative measures may attain one or both of these aims and even the preventive measures sometimes play a curative role.

This curative role is, in the highest degree and, it could be said, by order of urgency, the attribute of measures suitable for controlling and eliminating the damage caused through erosion and insolation; the meaning of this control has been indicated at the beginning of the chapter.

There are other measures, particularly those which follow, by which all or part of the desired curative effect can be obtained. They are based either on the protective, loosening and enriching action of auxiliary plants occupying the soil at the same time as the main crop or before replanting in the same field, or again on the reconstructive role of the addition of organic matter, more or less decomposed, to the soil to be improved or restored; being well known, the techniques employed to this end need not be mentioned; moreover, their discussion would take us too far away from the point.

Practice of selected weeding, the use of cover, shelter or shade and green manure plants, the preparation and application of compost (artificial manure replacing the natural manure, rare and not like our farm manure).

To these processes is connected another which has already been mentioned, this is wooded fallow obtained by the establishment of a stand of indigenous or exotic species — preferably leguminous — of rapid growth, hardy and not very exacting, which can check eventual laterization and modify the climate of the soil by furnishing the latter with cover and humus; from the agricultural standpoint, this process may serve to restore, over a fairly long period, crop lands long abandoned, or to maintain in a fertile condition, even to improve, large areas which will be used at a future date, all independently of the production of small timber and firewood.

For the most part, these measures act chiefly through the restitution of the organic matter. Does this mean that this restitution will always and everywhere

suffice to assure the productivity of Congolese soils? Certainly not and, from this moment, while the methods for restoring the reserves of humus are being brought into their true light and propagated, there is every reason to prepare, by means of experiments as varied and numerous as possible, for mineral restitution which will enable the proper balance in the soil to be obtained.

In the meantime, however, the most pressing need is physical restoration through the effect of organic restitution, which, moreover, will already assist towards the mobilization of certain mineral reserves of the soil. After this preparatory stage, the rational utilization of imported concentrated fertilizers will have to be considered without delay.

Certainly, it will not be easy to get the modification of the methods employed until now generally accepted; this will necessitate much patient effort, and also numerous tentatives and attempts, particularly as regards native agriculture, but how fruitful will be the results! If these pages contribute towards this end, it will be their best justification.

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ALMOND GROWING THROUGHOUT THE WORLD: (3) THE UNITED STATES

A. PASCUAL

In this article, the present conditions of almond growing in the United States are described from the standpoint of cultivation, trade and industrial applications.

Origin and cultivation zones

The cultivation of the almond in the United States is of very recent date. It started in 1849 when, after various experiments carried out in the States of the Union, it was found that only California possessed the necessary climatological conditions for an industrial type of crop. Its extension in California was not checked, as in the countries of the Mediterranean Basin, by old traditions, prejudices and customs in methods of cultivation, nor for want of pecuniary resources. It is not surprising, therefore, that California has model almond plantations, the development and production of which have augmented continually up to covering practically entirely the increasing demand of the home market.

The almond is cultivated in nearly all the districts of California, but the chief centres are to be found in the valleys of Sacramento and San Joaquin, and also on the hills in the South of the State, in the zone situated along the coast. Although, according to the agricultural census, the almond is cultivated in other States, the area under cultivation is so small that it may be asserted that California has the monopoly of almond prouction. Already in 1920, of an area of approximately 23,000 ha. grown to this crop throughout the Union, 99 per cent. was situated in California.

By 1927, the almond groves in California already covered 40,000 ha., of which 34,300 in production and 5,700 under young trees not yet come into production. In the this year, the principal almond growing districts were San Lui Obispo, Jolo and Butte where 24,000 ha. were under cultivation, in other words, 60 per cent. of the total area under almonds in the State of California.

During the last 15 years, there has been a continual increase and in 1938, there were 66,560 ha. under almonds, of which 3,200 had not yet come into production.

Present production amounts to about 400,000 qls. unhulled almonds as against 160,000 qls. in 1926 and 62,000 qls. in 1921.

Among the almond producing countries, the United States hold third place as regards volume of production, but they are the first as regards organization of production and trade. It is the only country where the almond plantations are established on a scientific and purely industrial basis, because it has benefited from the experience of the principal producing countries of the Mediterranean Basin. The cultural technique has profited considerably from agricultural science. The soil has been carefully selected, varieties, pollinization, diseases and pests, cultivation technique, running costs of the principal plantations, identification of varieties, standardization of the product, etc. have been meticuluously studied. For this purpose, the California Almond Growers Exchange, a purely commercial organization, works in close colaboration with the School of Agriculture at San Francisco and with the attached Agricultural Experiment Station. Almond growing in California appears, from both the agricultural and commercial viewpoint, as a powerful technical organization.

The spirit of initiative, the close collaboration of science and practice, the spontaneous need of association of the Americans, facilitated the creation of agricultural cooperatives among almond growers. In 1910, all the cooperative associations which existed were combined into one group: The California Almond Growers Exchange, which canalizes all efforts regarding production, trade and technique in this field; at present it monopolizes the entire almond production and trade of the United States. Cooperativism has facilitated considerably the propaganda made with a view to improving the agricultural technique.

In establishing the Californian plantations, great care has been given to choice of land and plantation work, as it is on these that the degree of vigour of the trees mainly depends. Experience has shown that various almond plantations do not give good yields because the composition of the oil is not suitable. The best plantations are established on light, permeable, deep, stony and calcareous soil.

Soil and cultivation care

In poor soils, the almonds were planted at a spacing of 6× 6 metres, while in the rich soil of the plains, spacing is usually 9 × 9 metres. Californian growers graft at a short distance from the ground (35-40 cm.) in order to develop the tree laterally rather than perpendicularly, which thus facilitates harvesting of the fruit and the treatment of diseases and pests.

The production of the almond tree varies more, from one year to another, than that of other fruit trees. Fluctuations depend on climatic conditions at the time of flowering, on the variety cultivated, on the composition of the soil and the spring frosts. The almond starts coming into bearing at 4 or 5 years, then production increases up to 12 to 20 years and becomes stabilized up to about 25 to 30 years, after which it begins to decrease. In general, it is estimated that the production of a tree over 30 years old is not economic. In California, the general production average varies between 750 and 850 kg. per hectare. In many plantations, however, 1,200-1,300 kg. are obtained. In the almond groves of the University of California, a production of 3,000 kg. per ha. was attained.

Varieties

During recent years, particular attention has been given to the problem of varieties according to the requirements of the grower, dealer and consumer. Naturally the first aim is to obtain varieties having an abundant and constant yield consequently, the tree should be hardy and well developed, fertile, late flowering or resistant to spring frosts and to diseases. For the dealer and the consumer, the varieties should produce large almonds of good appearance, of pleasing taste and with a high oil content so that they can be employed in all branches of industry.

Recently an endeavour has been made to reduce the number of varieties in order to standardize production. In 1927, the number of varieties cultivated amounted to 60 and even then it was considered that a dozen varieties were sufficient to meet the market requirements. It was a question, therefore, of solving the following two problems: (1) increasing the yield per hectare in order to reduce production costs; (2) cultivating few varieties so as to facilitate the sale of the product through standardization of types.

In 1938, a systematic study was made of the almond varieties cultivated in the United States, and about 150 were described, more than half of which were scarcely cultivated. The most popular number about 15: *Nonpareil, I. X. L., Nec Plus Ultra, Peerless, Princess, California, King Silver, Golden State, Sewelling, Drake, Languedoc, Texas* and *Eureka*. The first seven varieties are the earliest, that is, the fruit is fully ripened in Augut-September. The *Nonpareil* variety, which is the earliest of all, ripens at the beginning of August, two weeks before the *I. X. L.*; this in turn ripens a week before the *Nec Plus Ultra*, which attains maturity two weeks before the *Drake* variety.

The varieties *Nonpareil* and *I. X. L.* are intersterile; they are also interfertile with *Nec Plus Ultra*. *Languedoc* and *Texas* are intersterile. *I. X. L.* and

Peerless are practically intersterile. The variety *California* proved to be one of the best pollinators of the others. *Drake* is interfertile with *Nonpareil, I. X. L., Nec Plus Ultra, Peerless* and *Jordan. I. X. L.* is interfertile with the *Drake, Jordan, California, Languedoc, Nec Plus Ultra* and *Texas* varieties; *Nec Plus Ultra* is interfertile with *California, Drake, I. X. L., Languedoc* and *Nonpareil.*

Among the soft-shelled varieties stand out *I. X. L., Nec Plus Ultra* and *Drake. Nonpareil* has come to the fore in recent years through the good quality of the almonds and the facility with which they can be husked. These varieties are also the best for confectionery. *Eureka* gives very good results. The Spanish variety *Jordan* has also asserted itself, but does not give the results expected as regards productivity. In general, the most popular varieties are those which are of uniform size, a golden yellow colour, with full kernels free from gum.

I. X. L. produces full kernels, free from gum, while *Nec Plus Ultra* has a tendency to produce kernels with gum. The kernel of the *Drake* is moderately large, of good flavour and full. For blanching, large flat almonds of excellent flavour are required; these requisites are combined in the almonds of the *Nonpareil* variety.

Harvesting and grading

Harvesting starts at the bginning of August for the earlier varieties and continues up to mid October. This period, however, varies from year to year according to the climatic conditions of the season which may advance or retard maturity.

After harvesting and drying using the same methods as in Europe, each member of the cooperative association brings his quota to the cooperative warehouses. On its arrival, the product is examined. If not properly dry, which would hinder good preservation, the almonds are passed through drying kilns to assure good keeping quality and prevent blackening through dampness. Subsequently, the almonds are classified according to quality or grade by specifying the yield and commercial value of each lot. The consignments are then stored with great care and on a label attached to each sack are indicated the name of the member of the cooperative, the quality of the product, the yield and commercial value and time of entry.

The almonds, according to the hardness of the shell are classed into four categories:

(1) Papershell: Almonds of this category have a very thin shell which can easily be broken between the fingers of one hand only.

(2) Softshell: The almonds of this category have a slightly thicker shell than those of the preceding category, but they can also be broken by the fingers using both hands.

(3) Standardshell: To break the almonds of this category, considerable pressure of the hand is necessary or else nut-crackers have to be used.

(4) Hardshell: This category comprises all almonds which cannot be broken with the fingers and which, on the contrary, require strong pressure in using the nut-crackers.

Softshell almonds intended for direct consumption as dessert, are moistened with steam for 15 to 20 minutes and subsequently exposed for an equal period to sulphur vapour, in order to give the product a golden yellow colour. They are then carefully dried, places in sacks and stored until sold. Almonds treated in this way do not keep so well as the others and if the treatment is not properly carried out, the almonds may acquire an unpleasant sulphur odour. The Cooperative packs these types of almonds in standard sacks, the weight of which varies according to quality: 39 kg. for *Nonpareil* 36 kg. for *I. X. L.*, 34 kg. for *Nec Plus Ultra*, 41-45 kg. for *Drake* and 45 kg. for *Languedoc*.

The Almond Growers Exchange has a model establishment for shelling almonds at Sacramento (California). A mechanical device transports the almonds into the raised silos from where they fall into the hullers; a strong current of air removes all shell debris, after which the kernels are graded. The shells, always by mechanical means, are taken to the furnaces for the production of steam and the motive power required to carry out the different manipulations. The kernels are taken to special rooms where they move along mechanical conveyor belts before women operators who examine them in regard to condition and quality. After this preliminary inspection, the almonds are transmitted to a system of separators where they are divided into different categories according to size. They are then pass again over revolving sheets before the workers who examine the product minutely before sending it to be packed. Here, always by mechanical means, the almonds pass into an automatic weighing machine which diverts them into exactly weighed cases. The closed and stamped cases are then forwarded to the dispatch department to be sent to the various markets of the Union.

Trade

The first task of the Almond Growers Exchange, after its foundation, was to establish a trade-mark corresponding to perfectly uniform and accurately standardized types. The activity of this cooperative was not limited only to the sale of shelled or unshelled almonds; some types which formerly were prepared by the American industry, were also produced, namely: Salted almonds, blanched almonds, roasted and toasted almonds. These types are packed in carefully selected wrappers and are sold for direct consumption.

In general, and contrary to the usage in the Mediterranean producing countries, the Californian almond, whatever the type of preparation (shelled or unshelled, raw, salted, toasted, blanched, etc.) is sold under a special brand, ' Blue Diamond Brand '; the botanical name of the variety is also given.

Considerable attention is given to careful packing. Each type of almond, previously sterilized, has a special pack (sack, small case, cardboard box, barrels resembling herring barrels in galvanized iron, tin can and box, glass bottles, etc.) which is selected with considerable care. The packs differ in dimensions, size and weight. Toasted and salted almonds are sold in tin boxes of 2.75 kg. or in small cases which hold six of these boxes. They are also packed in glass containers of 80-115-175 and 227 gm. net. Blanched almonds are sold in small

cases of 11.5 kg. net or in iron barrels of 45 kg. net. To facilitate keeping of the product, especially if prepared in some way, such as toasted, blanched or salted almonds, the containers are carefully sterilized and sealed under vacuum.

Foreign trade in almonds has dropped appreciably within the last few years owing to the constant increase in home production. Up to about 12 years ago, the United States imported on an average 300,000 qls. of almonds a year, chiefly from Spain and Italy, but within the last five years, these imports have been reduced practically to zero, while American production has increased by 45 per cent. On the other hand, the annual consumption per capita has decreased in the last twenty years, falling from 372 grams in 1921 to 329 in 1928 and 317 in 1939.

The chief disease which attacks the almond in California is crown gall (*Bacterium tumefaciens*) which is one of the most serious pests to the Californian crop. One of the most difficult diseases to control is that caused by the fungus *Armillaria mellea* as the agent of this disease tends to spread and propagate below the soil level, in the roots of the trees. The fungi *Coryneum beyerinkii*, *Cercospora circumscissa* and *Gloeosporium amygdalinum* occasion much damage to the flowers, leaves and fruits. *Puccinia pruni* is less harmful.

Of the insects which attack the almond in California, among the most important, mention may be made of *Bryobia pratensis*, *Tetranychus telarius*, *Anarsia lineatella*, *Aegeria opalescens* and *Plodia interpunctella*.

The possibilities of the further development of almond cultivation are limited, not because of want of suitable soil as it has already been found that this tree could flourish under good conditions also in the States of Illinois, Ohio, New York and other States of the East, but because of the home market which has already reached saturation point with present production and because of the very restricted possibilities of exporting to the South American countries, seeing that the Californian almonds cannot compete in price with the product of the countries of the Mediterranean Basin.

MISCELLANEOUS INFORMATION

Sorgo, winter beet and alcohol production in hot dry regions

The many experiments carried out in the south of Italy show that as yet sorgo has not found any rival as an alcohol producing plant in the irrigated zones of the hot and arid regions of Southern Italy, nor in normally cool regions.

It holds first place both as regards the quantity of fermentable sugars contained and the amount of foliage and seed available to the farm. As well as 40-50 qls. fermentable sugar per hectare, sorgo produces 20-40 qls. grain which is a very good substitute for maize, and 50-60 qls. of foliage easily preserved and having a food value equal to that of the best forage plants. Unfortunately, conditions are not favourable for sorgo which thus furnishes a reduced yield in cane and grain in the South where the factor limiting production is the low moisture content of the soil. This is the case for all summer root crops, including the beet. The industrial cultivation of sorgo

is not practicable in regions where, at the critical moment, one or two irrigations are not possible. Professor E. PARISI and Professor G. TOMMASI, Director of the Agricultural Chemistry Station at Rome, proposed—in order to increase the yield of fermentable sugar and to obtain a fuller utilization of the sorgo distilleries—to turn to winter sugar-yielding plants, such as the spring beet which can give high yields and the so-called ' winter ' beet which can vegetate even during the coldest months and which attains maturation before the arrival of the severe summer heat.

In Spain, in the zones with a climate similar to that of the Po Valley (Navarra and Rioja, Aragón, Lerida, Monzón, New Castile), beets are sown in March or April; in February, in the hotter areas (Asturias, León, Valladolid and Valencia, Miranda, Vitoria) and at Christmas in the regions where the seasons are about the same as in Southern Italy (Cordova and Seville, Grenada, Malaga, etc.). It is the same in New Mexico, California and all the hot arid regions of the United States, where beets are sown, according to climate, in November, December, January and February.

It is erroneously believed that plants run to seed have a much lower sugar content than those which have not flowered and that the roots, becoming hard and fibrous, cannot be utilized. On the contrary, the numerous analyses made on samples taken from different beet-growing zones indicate that beets having flowered are richer in sugar and have a purer juice than normal beets. The treatment of ' bolted ' beets, very difficult in ordinary sugarworks owing to their hardness and high fibre content, is very easy in the sorgo distilleries where the roots of beet seed plants cultivated for seed production on a relatively large scale, can be processed. At present, these roots are only used as fuel while the exhausted product after leaving the sorgo mills could be utilized in the preparation of excellent feedingstuffs for livestock.

Winter beets.

The disadvantage of the woodiness and the smaller size of the roots of beets run to seed, however, is so great that it annuls the advantages of early sowing.

This can easily be remedied by propagating in southern countries with a dry summer, the so called winter beet, recently bred by Professor NEMETH of Budapest. This beet begins the first phase of its development in autumn, conserves its foliage intact even during the coldest months and immediately recommences growing vigorously in spring, rapidly attaining the high yields of beets sown in spring produce in autumn. The chief cause of insufficient beet production in Europe must be looked for in the brevity of its vegetative period; a delay of 15 to 20 days in sowing is enough to reduce the growth cycle of the plant by a tenth, causing an appreciable diminution in yield.

On the other hand, according to NEMETH, the winter beet, while having the same sugar percentage as the ordinary beet, in Hungary produces 80 per cent. more roots. It is probable, therefore, that in the regions of the South well supplied with water in the autumn and spring, but arid and often insalubrious during summer, and consequently often abandoned and uncultivated, the winter beet would constitute an important factor as regards increased cultivation of the sugar beet.

The cultivation of the Nemeth beet also presents the following advantages:

(1) Enables the introduction of an important industrial root crop where no root crops are included in the rotation scheme owing to the want of irrigation water, indispensable to these plants.

(2) Allows the utilization, in many case, of land released by the winter beet for other crops: cotton, castor oil plant, etc. in the drier areas or maize, tomatoes, etc. in the fresher and irrigated lands.

(3) The beet is practically free from the attack of insects and plant parasites which cause appreciable damage to beet crops (*Cleonus*, *Lixus*, *Cassida* and sclerotium diseases).

(4) The output of the sorgo distilleries can be doubled or tripled by means of winter and 'bolted' beets.

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G. S.

Dried vegetables in block form

Under present conditions, it is necessary to examine the new methods and processes of preparing and preserving different food products. According to the '*Obst und Gemüse*' (Nos. 2, 7, 1942), the Danish industry now puts up a new quality of dried vegetables known as 'Urta Blok Gröntsager' (Urta vegetable blocks): According to the information given, an Urta block corresponds to 1 kg. of fresh cleaned vegetables. A block can be divided into several pieces. The fresh vegetables are deprived of their water content by a patented process of a Danish engineer Aage GERNOW.

By means of this process, vegetables can be preserved for years. Suitable vegetables are spinach, white-heart cabbage, winter cabbage, red cabbage, carrots, stringless beans, julienne soup mixture, etc. The water is extracted by pressure, without in any way affecting either the nutritive value or the aromatic substances of the vegetables treated; moreover the vitamins, contrary to what takes place with other processes, also remain intact during storage. The vitamin content was controlled by Prof. Dr. SCHÖNHEYDER of the Biochemical Institute of Aarhus.

After the water is extracted, the vegetable is reduced to a fraction of its original volume and only takes up the amount of space equivalent of a plate not weighing more than 100 gm., corresponding to 1 kg. of fresh vegetable. However, after an hour's immersion in a litre of water, the vegetable recovers its natural weight. Subsequent treatment is identical with that of the fresh vegetable; taste and nutritive value are the same.

Aage GERNOW carried out his experiments based on the attempts formerly made on the preparation of preserved fish, adopting a similar compression process.

It is known, moreover, that in high sea fishing the question of space for effective load is an old problem. The process indicated would make for great saving in this case. From the experiments now carried out, it would appear that the fish thus treated can be kept for years without its nutritive value and vitamin content being affected. A fully equipped test installation was already in operation in Norway before the war.

According to a report from Copenhagen, there is a method regarding the new possibilities of utilizing horse-chestnuts. Messrs BÖRGE KRUSE and HOFMANN-BANG succeeded in extracting from horse-chestnuts a material which can be employed in the chocolate industry and as a substitute ('Ersatz') in the preparation of marzipan.

During the last season, with 50,000 kg. of chestnuts, 12,000 kg. of dried substance was prepared which was sold at 5.50 crowns per kg. to a chocolate factory. At the same time, 35,000 kg. of 'Sapolin' were produced which were reserved for the soap industry at the price of 55 ore per kg. The process employed is rather complicated.

E. L.

New treatment applied to rice so as to maintain the right cooking point over a longer period. — 'Avorio' rice

Despite all the attempts made up to date, it has not yet been possible to generalize the consumption of rice in barracks, hospitals, colleges and other communities, because this cereal, even if served half cooked at the beginning, became mushy towards the final dishing out of the rations and consequently was not relished by the consumers.

To prevent this disintegration which is due to unequal degree of cooking between the external and the internal part of the grain, the rice should be subjected, before the ordinary industrial treatment, to a hardening of the peripheral layer of the grain, a sort of envelopment of the grain in a resistent and compact layer.

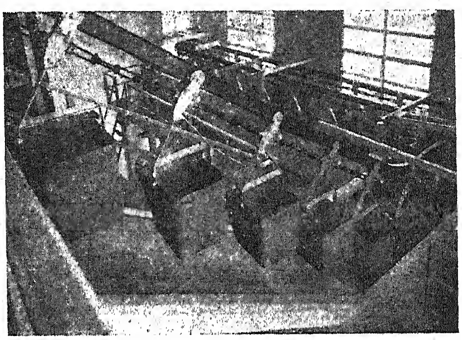

FIG. 1. – Thermal bath.

This new process was invented by M. ZEPHIRLO, with the collaboration of A. GARIBOLDI and his brother Attilio, together with Prof. Luigi BORASIO of the Vercelli Rice-growing Experiment Station. The rice treated in this way was called 'Avorio' rice.

Under the direction of the Rice Office (Ente Risi) an important establishment has recently been established at Pavia for the production of this type of rice. It is estimated that the present production of rice, with the organization and importance of Italian rice-growing, varies round about 9 million quintals with a unit yield of 57 quintals per hectare.

The 'Zephirlo' process effects the hardening of the external parts of the grain by treatment in the autoclave with steam under pressure, of the crude rice. The action of this treatment is very complex: it produces a partial coagulation of the proteins and a dextrination of the starches which consolidate the structure of the rice; this becomes more compact and more resistant in processing.

Deterioration from the nutritive standpoint is limited and, by reducing the percentage of broken rice, the yield in whole rice is raised appreciably. As has already been pointed out, however, the chief advantage of 'Avorio' rice lies in its better re-

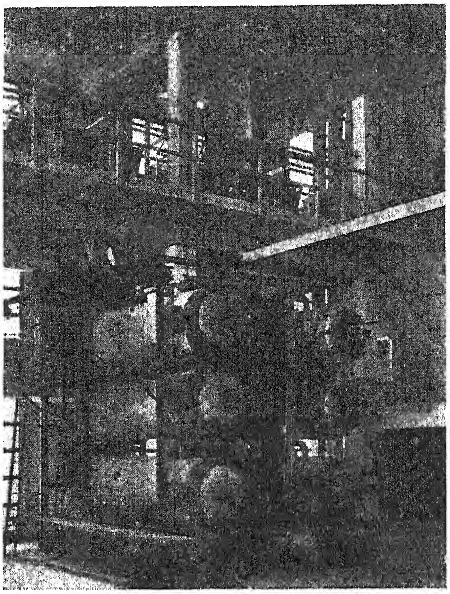

FIG. 2. – Set of autoclaves.

sistance to cooking; it does not become mushy, even if not served until some time after cooking, which makes it suitable for colleges, barracks, etc.

The analyses made by Prof. Luigi BORASIO gave the following results:

	Original rice %	'Avorio' rice %
Moisture	13.60	11.55
Ash	0.46	0.57
Fat	0.30	0.54
Protein	6.10	6.30
N-free extractives	79.19	80.44
Fibre	0.35	0.50
Total P_2O_5	0.24	0.31
Phytinic phosphoric anhydride	0.07	0.10

The characteristics of the rices as regards right cooking point were as follows:

	Original rice	'Avorio' rice
Volume of 100 gm. of crude rice: cc.	70	70
Degree of cooking: minutes	16	25
Water absorbed: grams	158	190
Volume of cooked rice: cc.	235	270
Increase in volume	3.3	3.8
Disintegration during cooking	4.4 %	4 %

In the new establishment at Pavia for the production of 'Avorio' rice, the thermal energy and motive power are obtained by utilizing rice husks. The 'Avorio' treatment is carried out in a section of the establishment containing the necessary apparatus for thermal soaking (FIG. 1) and two sets of three autoclaves each (FIG. 2).

In an adjacent department have been installed 16 drying shafts divided into two groups of eight; separated by silos for the storage of crude rice while awaiting the final dessication. The two groups are fed by two powerful hot air shafts. The air is heated by means of a device which recovers the heat of the boiler furnace through a network of subterranean flues.

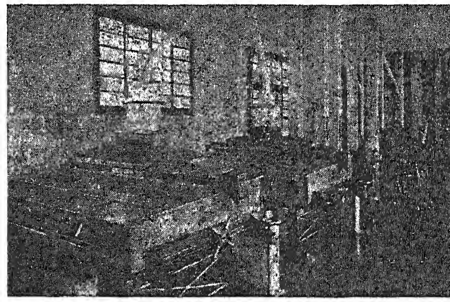

FIG. 3. – Huskers and plansifters

Another department of the establishment consists of a modern rice plant with a capacity of 120,000 quintals per year, here the rice treated with the 'Avorio' method is processed (FIG. 3). This department comprises huskers, oscillating separators, polishing machines and an electric-thermal plant using rice husks.

G. S.

BOOK NOTICES *

GUSTAFSON, A. F., Soils and soil management. New York and London, McGraw-Hill Book Company, Inc., 1941, 424 pp., 145 fig.

In general, one cannot complain of a want of treatises on soil science. They are to be found in every language but most of them are addressed to scientists, whereas few attempts have been made to enable the farmer to understand the characteristics and value of different soils, the signification of the cultivation methods adopted based on old traditions, the efforts which must be made to conserve the soil and render it fertile. The book of GUSTAFSON, therefore, meets a real need. It is intended for agriculturists in the United States, but would also be useful in Europe where works of this type are wanting.

The author deals first with the geological origin of soils and subsequently discusses their physical properties, soil organisms, organic matter, the relation of water to soils and plants and the control of water in the soil. This is followed up by practical measures: tillage, erosion control, soil acidity and its control by liming, management of alkali soils, nitrogen, farm manure, green manures, mineral fertilizers, crop rotations, effect of fertilizers on the soil over a fairly long period, cultivation of peat soils.

The choice of illustrations and statistical tables is a happy one. A brief questionnaire is appended to each chapter thus enabling the student to test his knowledge.

W. B.

* Under this heading reviews are given of books presented to the Library.

NEDERLANDSCHE HEIDEMAATSCHAPPIJ: *Boerderijen in Nederland, onder redactie van de Nederlandsche Heidemaatschappij.* Amsterdam, N. V. Wed, J. Ahrend & Zoon, 1941, 10 pp., 123 small illustrations, 52 large figures, each with plan.

Since Professor J. H. GALLÉE published (in 1906) his masterly work on peasant housing in the Netlerlands, entitled 'Het boerenhuis en zijn bewoners', a certain number of other books have appeared. Some are chiefly of a regional character, others treat on the artistic aspect, and others again primarily on construction. There was no work, however, similar to that here reviewed, as it describes both the present types and, in each case, the best methods of construction, which should maintain, as far as possible, the forms in use in the different regions.

This book opens with a general section, studying, *inter alia*, the types of peasant houses in the Netherlands and their relation to a region to be settled. A map indicates the distribution of the ten existing types. Farms of 10 to 25 hectares predominate; therefore, it is primarily for these that buildings must be studied, although often there are also smaller and larger farms. This fact is particularly important in new clearings where the construction of farm houses has to be entirely adusted to economic and social conditions and, at the same time, in harmony with the surroundings. Also with the consolidation of holdings, often other houses have to be built; but, in this case, there is less liberty in choice of site and size, so that it becomes more difficult to realize a harmonious whole. It is not possible here to review all the factors regarding construction; what has been indicated above, however already shows how complicated this question is. The chief merit of this book is that all the aspects are shown.

The second part of the work deals in detail with the building and arrangement of peasant houses as they should be carried out under existing conditions. Ample information is given on the different farm buildings and their parts. The subsequent chapters concern the housing of farm hands and the construction costs of rural buildings.

This book was prepared by three specialists under the direction of the Netherlands Wasteland Exploitation Association ('Nederlandsche Heidemaatschappij'), which has given considerable attention to clearing and to the consolidation of holdings where the construction of new peasant houses occupies an important place. In publishing this work, the said Association aims at directing a more detailed study of the subject in a way which should lead to a greater development in the construction of peasant houses in the Netherlands, and certainly this book will contribute considerably towards attaining this aim.

The two parts of the work contain a large number of figures and excellent phototypes. Very clear designs complete the views of the peasant houses.

J. P. v. A.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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THE DURATION OF THE BEET CYCLE

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Up to the present, very extensive observations have been made in connection with the beet cycle (Beta vulgaris *L.*) *and the possibility of making radical changes in the behaviour of individuals, or groups of individuals, when passing from the vegetative to the reproductive phase.*

In our case it was also imperative that the problem should be thoroughly examined from each of its numerous aspects and especially from the standpoint of application, because it would be impossible to imagine the selection of a cultivated type without a previous study of the various points connected with the biology of species, which in our case assumed an importance and scope of fundamental value.

Moreover, the observations made during a period of some thirty years were destined to contribute towards the gradual weakening of many old hypotheses, as shown in publications appearing from time to time in various reviews.

For the above-mentioned reasons we will not dwell upon observations and research concerning the roots of beets which have run to seed during the first year, nor on their utilization for industrial purposes.

1. The cycle of beets growing in the wild form *

As may seen from his many works published since 1892, Em. VON PROSKOWETZ was one of the first to devote considerable study to the problem of the cycle of wild forms. Mention should also be made of the studies effected by W. RIMPAU (1876-1880) and F. SCHINDLER (1891). According to the first of these authors the 'biennality' (biennial cycle) of the cultivated type has been produced by cultivation, so that when the beet runs to seed (bolting) this should be considered as a return to the primitive type (1880, pp. 191 and 199). In his notes made in 1926 and 1929, F. SCHNEIDER described the results of the research work undertaken with W. RAATZ since 1915. Mention should also be made of the contributions of: BÉGUINOT (1913) — SHAW (1917) — BARTOS (1922-23) — DE VILMORIN (1923) — VAVILOV (1926) — WESSELY (1926) — RUBASHEVSKAIA (1931) — KRASSOCHKIN and OUZUNOV (1931) — RASMUSSON (1932,

* A list of the wild forms of *Beta vulgaris* L. is given (ULBRICH, *Chenopodiaceae;* Leipzig, 1934); in Vol. 16 of ENGLER and PRANTL's work but this aspect of the question does not correspond to our special purpose, which is to consider the type from the standpoint of application.

1933) — TJEBBES (1933) — SCHEIBE (1934) — LIPPMANN (1925 and 1935) — COLIN and PICAULT (1934) — DAHLBERG (1934) — ZOSSIMOVITCH (1934, 1935, 1938, 1939) — DECOUX (1935) — MOLDENHAWER (1935) — SCHNEIDER (1936, 1937) — COLIN (1937) — TSCHERMAK-SEYSENEGG (1928) — HERMAN (1937) — STEHLIK (1937, 1938) — COONS (1938) — DAHLBERG (1938) — DOXTATOR (1938) — DUDOK VAN HEEL (1938) — SEITZ (1938) — SCHWANITZ (1940).

Our studies were devoted chiefly to the type found growing in the wild state along the Adriatic coast, which owes its survival as a species principally

FIG. 1. – Plants of the wild form with practically stable biennial balance.

to its seed's capacity to remain on the surface of the soil for a number of years without losing its germinative power. We did not, however, fail to make observations concerning the cultivation of numerous groups of individuals reared from seed sent to us from several European and extra-European countries.

Mention should be made of the fact that, as opposed to the observations made, for instance, by E. VON PROSKOWETZ, in connection with the type found growing along the Quarnero, we were unable to observe the presence of individuals with pigmented roots, either in their natural surroundings or under cultivation.

On the other hand, by applying a process of selection to a large number of progeny, through several generations (taking, of course, all the precautions necessary in order to avoid hybridization from extraneous pollen due to cases of vicinism, such as are often observed in research work of this description), we

have attempted to ascertain whether it would be possible to pass from the wild form to the cultivated type, as is admitted by some research workers; all our attempts have, however, proved fruitless.

On the contrary, we did not find it difficult to separate progeny with a practically stable balance tending towards ' biennality ' (Fig. 1); in short we have crossed these with cultivated types and have thus obtained biotypes with a well spread and vigorous aerial vegetation, resistant to both *Cercospora* and drought; after careful selection, these biotypes have earned a place in major crop production.

2. Beets of the cultivated type bolting during the first year under ordinary crop conditions

This aspect of the problem, as everyone knows, is the one which has aroused the greatest interest from the practical standpoint, as proved by the large number of valuable works on the subject. The tendency to ' annuality ' (the annual cycle), observed ever since this crop began to be grown for industrial purposes (ACHARD, 1809), may sometimes even become paradoxical and, in this respect, certain years have become memorable; the chief of these are the following: 1867 in Germany (RIMPAU, 1880) — 1884 in Bohemia (HERLES, 1886) — 1889 in Germany (RIMPAU, 1902) — 1903 in Italy (BELLUCCI, 1904) — 1907 in France (LEFORT, 1907) — 1908 and 1909 in Germany (GONNERMANN, 1908; NEUMANN, 1910) — 1921 in France (BERNARD, 1921) — 1923 in Germany, Bohemia, Denmark and Sweden (REJTHAREK, 1923-24; RUDORF, 1926; RÖMER, 1927; VOSS, 1936) — 1927 in France, Germany, Bohemia and Poland (RÖMER, 1927; PLAUT, 1927; WAGNER, 1928; PIEKENBROCK, 1928; CLASSEN, 1931; CHMELAR, 1928; DUDOK VAN HEEL, 1927; WADSACK, 1928) — 1928 in Italy (PERTICA, 1928; PARISI, 1929; FORNACIARI, 1934), Poland and Germany (RÖMER, 1931) — 1933 in Bohemia (CHMELAR, 1934; PAZLER, 1935) and France (DUCOMET, 1933) — 1938 in Bohemia, Germany, England and Sweden (LÜDECKE, 1938; ADICKES, 1938; Anonymous English author, 1938; STEHLIK, 1939; OLSSON, 1939) — 1939 in Germany (RÖMER, 1940).

There is a great difference of opinion concerning the reasons for the appearance of annual plants and it may even be said that what H. BRIEM wrote on the subject in 1902 is still as up-to-date as it was then: ' Whether the type cultivated is obtained by selection from wild forms with an annual cycle, or whether it derives from the crossing of various forms not found in the wild state, how can we explain, among other things, why individuals produced by the same lot of glomerules belonging to the same type and sown at the same time *do not all* run to seed at the same time? '. PH. DE VILMORIN (1908) expressed his thought as follows: " How can we explain why some of the seeds contained in the same sack, produced by the same mother plant, bolt while others do not? " *.

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* Experiments made for this purpose with Dr T. COSTA by sowing small seeds extracted from glomerules and set to germinate in advance, so that only those which actually germinated were put into the ground, showed no alteration in the behaviour of individuals.

Similarly, STROHMER's opinion (1902), according to which low temperatures would produce modifications in the respiratory activity, with the formation of an excess of reducing sugars, with the result that the plant reacts by speeding up the differentiation of its reproductive organs, is considered as pure hypothesis since, even in this case, it would not be possible to explain why the phenomenon occurs only in some of the individuals of the whole mass.

According to some authors, the ligneous condition of the roots is an index of the tendency to bolting and it is considered advisable, when selection is taking place, to eliminate those subjects where this characteristic is more or less marked. But our research work (the results of which have not been published), have shown that it is easy to separate very ligneous progeny with only a slight tendency towards bolting, and vice-versa.

Nothing remains therefore but to have recourse to the thesis that the common ' varieties ' consist of an *ensemble* of biotypes with varying tendencies; arguments to the contrary may also be adduced, however.

Our observations, made prior to 1917, led us to connect cultivated beets with the group of inconstant races or strains, facultatively biennial or annual, described by Hugo DE VRIES (1903); undefinable in the sense that no process of selection can define, under a stable form, the characteristic of ' biennality ' or ' annuality '. Nevertheless we were able later to separate the races having an absolutely definite characteristic of ' annuality ' of a stable nature and capable of producing, as will be shown below, two generations in a single year under ordinary crop conditions.

Two questions come to mind simultaneously concerning the types cultivated in the normal biennial cycle: (1) To what extent is the tendency to bolting in the first year connected with the genotype ? — (2) What are the causes, independently of the genotype properties, whose influence results in an increase or otherwise of this tendency ?

Only the broad lines of this vast subject can be studied here.

3. Bolting and its relation to ' varieties ' and source of seed

Every experiment which aims at establishing a comparison between the values of several varieties, both from the agricultural and industrial points of view, has led to the observation that, everything else being equal, varieties or types do not all behave in the same way as regards tendency to bolting during the first year.

Among the various contributions to this side of the question, mention should be made of the following: RIMPAU (1880) — WESTERMEIER (1894) — CSERCHATI (1899) — SCHUBART (1903) — PLAHN-APPIANI (1911-12) — BERNARD (1921) — RUDORF (1926) — DUDOK VAN HEEL (1927) — SAUBERLICH (1928) — MÜLLER (1928) — CHMELAR (1928) — KRÜGER (1928) — KRÜGER, WIMMER and LÜDECKE (1930) — ZALESKI (1932) — RÖMER (various contributions) — ESAU (1934) — PAZLER (1935) — VOSS (1936) — DE HAAN (1936) — WIMMER and LÜDECKE (1938) — LÜDECKE (1938) — ADICKES (1938) — OLSSON (1938, 1939) — PAZLER, RUZICKA and HAVRANEK (1940-41) — especial interest attaching to

RÖMER's contributions. Similar behaviour is, of course, observed in the mangold: among the latest studies in this connection, mention may be made of those by CHMELAR (1928), SCHNEIDER (1934), OLSSON (1938).

According to some authors (SAUBERLICH, 1928 — MALPEAUX, 1929 — RÖMER, in various works), those varieties which are richest in sugar content would appear to show a stronger tendency to bolting in the first year (the heavier types should therefore be preferred for early sowing), while other experimenters maintain that a high sugar content is not necessarily bound up with a stronger tendency to 'annuality'.

Moreover, in the international field and especially in agricultural and industrial spheres in the north and north-western countries of Europe, a deep conviction prevailed for some years that the seed produced in the eastern part of the continent (particularly in Poland), and to an even greater extent that produced in a southern climate (especially in Italy), engendered individuals with a greater tendency to produce floriferous stalks during the first year. Particular attention has been devoted to this subject by: KRAWCZYNSKI (1923) — SAILLARD (1925, 1927, 1929) — SAUBERLICH (1928) — BERKNER (1935) — DUCOMET (1936).

An interpretation for this fact has been found in the hypothesis that plants produced from seed formed in southern countries reveal this tendency because the seeds possess a greater germinative energy and speed than do the seeds produced in central and northern Europe, so that growth takes place as if sowings had been effected ten or twelve days earlier. In the opinion of other investigators, the reason is to be found in a simple fact of physiological predetermination, through which the faculty acquired in a given environment is observed chiefly in the first generation from the seed produced in this same environment and is lost later, more or less rapidly, when reproduction takes place in zones which differ ecologically.

In order to attain the desired explanation of such a controversial problem, the author of the present article, in a report presented to the International Cogress of Agriculture held in Warsaw, suggested in 1925 that experiments should be carried out on an international basis. The matter was taken up again in 1931-32 by the International Institute for Research concerning beets, at Tirlemont (Belgium) and a first note on the subject was published by F. DESPREZ in 1937. Our further observations have, however, led us to the conclusion (in 1941), that the execution of experiments of this description presents, in reality, more or less serious difficulties which were formerly unforeseen.

In this connection and still maintaining the hypothesis according to which the environmental conditions under which the plant passes through its second year of growth may affect the actual constitution of the seed and, consequently, the plant produced thereby, mention should be made of ROSNOWSKI's observations (1934): beets from the same homogeneous mass were set to fructify under different conditions (under glass, in ground exposed to the wind or in a sheltered spot) the individual plants produced by the seed from corresponding groups behaved in different ways as regards the tendency towards annuality. Experiments made by us, however, on the same lines, did not lead to such convincing conclusions.

Lastly, does any correlation exist between the outer appearance of the mother beets in full bloom and the tendency of their respective progeny to bolting during the first year ? Observations made a long time ago (1908) by SCHUBART led to the removal of any basis for this supposition, as has been fully confirmed by our experiments.

4. The tendency towards annuality in relation to the nature and fertility of the soil

A definite relation between the tendency to bolting and the nature and fertility of the soil was observed some time ago and has repeatedly been remarked upon, especially by: PROSKOWETZ (1895) — CSERCHATI (1905) — HOLLRUNG (1903) — MONTEMARTINI (1910, 1917-18) — BRAUNE (1923-24) — KRÜGER and WIMMER (1926) — KRÜGER (1927) — PLAUT (1927) — Anonymous English author (1928) — SAUBERLICH (1928) — MEIJER (1930) — CLAUS (1931, 1934) — ESAU (1934) — PAZLER (1935) — KRÜGER, WIMMER and LÜDECKE (1937) — LÜDECKE (1938) — VOSS (1940).

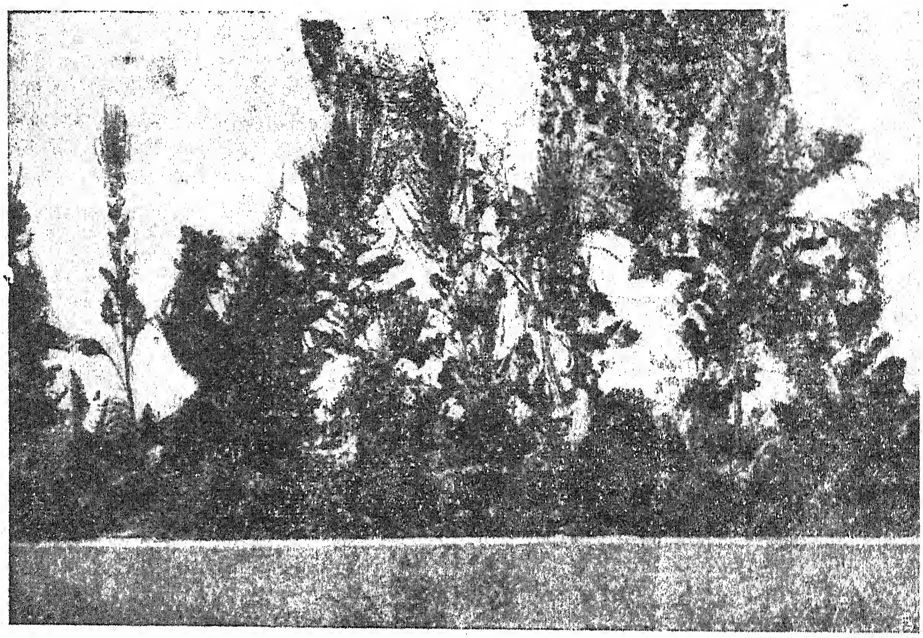

FIG. 2. – Plants which have run to seed in humiferous soil enriched with chemical fertilizers.

In any case, it was the fertility of the soil, rather than its nature which proved capable of increasing the tendency in question: the more fertile the land, the greater the number of plants, all things being equal, which ran to seed, and vice-versa. A similar observation was made by DE VRIES (1903) in the case

of the *Oenothera laevifolia*, the *Oe. lamarkiana* and the *Oe. rubrinervis* (which produced 21 per cent. of annual subjects in sandy soil and 98 per cent. in garden soil).

Special research in this connection, intended to obtain a definite explanation concerning the interdependent relations between the nature of the soil and its fertility as regards the increase or otherwise of the said tendency, was carried out between 1913 and 1916 by the author of the present article, in collaboration with T. V. ZAPPAROLI.

Two types were used for the experiment in 1913 and 1914: Wohanka ZR and Wohanka ER, cultivated in poor sandy soil and in the same soil heavily

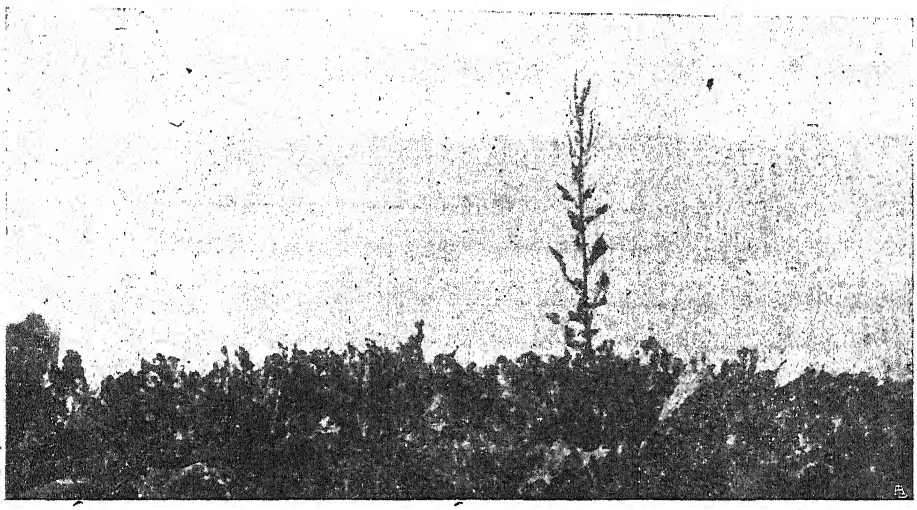

FIG. 3. – Plants which have bolted in poor sandy soil.

manured. The following observations were made in 1913: Wohanka ZR gave 4 per cent. of annual subjects in the first case and 24 per cent. in the second — Wohanka ER gave 13 per cent. and 56 per cent. respectively. In 1916 experiments were made simultaneously in poor soil and peaty soil, respectively without manure and heavily dosed with chemical fertilizers. The first year, under extreme conditions, the percentages for individual plants which ran to seed were: from 1 to 2 per cent. in sandy ground without manure — 55 per cent. in the peaty fertilized soil; in each case, of course, seeds were always taken from the same lot and sown at the same time (Fig. 2, Fig. 3). The influence of the nature of the soil and its fertility could not find any clearer confirmation than this.

5. The relation between bolting and the time of sowing

All authors who have studied the phenomenon under consideration are agreed in attributing to climatic factors a preponderant influence in the production of the tendency of cultivated beets to bolting during the first year. This fact was

described as long ago as 1809 by ACHARD himself, who was the first to have a clear perception of the mechanism of this phenomenon. Later (1876, 1880), RIMPAU made the following observation: ' The earlier sowings occur, the greater is the increase, *ceteris paribus*, in the number of plants which run to seed '. BRIEM, in his turn, wrote in 1912: ' When in a field one sees many beets which have run to seed, one might wager 100 to 1 that sowing took place in this field before the normal time in the district, so that a latent property has been able to manifest itself: had it been sown relatively late, the same seed would have produced but an insignificant number of annual plants '.

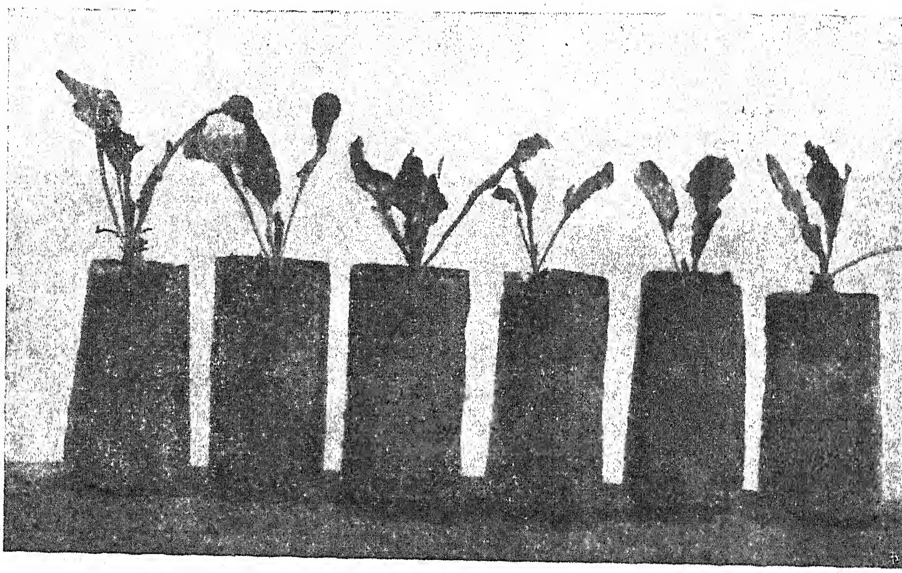

FIG. 4. – Plants of the ordinary sugar type remained in the vegetative state for 24 months.

Mention should also be made of many other contributions to the study of this subject, namely: BREYMANN (1887) — SAILLARD (1896) — CSERCHATI (1899) — WENDENBURG (1899) — HOFFMANN (1901) — GUTZEIT (1907 and 1908) — GONNERMANN (1909) — NEUMANN (1910) — BATESON (1911: cf. HALL, 1928-29) — MALPEAUX (1913) — BRAUNE (1923-24) — JUHA (1926) — RÖMER (various contributions) — VOELCKER (1927) — MÜLLER (1928) — PIEKENBROCK (1928) — KRÜGER (1928) — SAILLARD (1928) — HOLLRUNG (1929) — MALPEAUX (1929) — DUCOMET (1933) — CHMELAR and SIMON (1934) — CHROBOCZEK (1934) — SCHNEIDER (1934 and 1938) — PAZLER (1935) — LÜDECKE (1938) — OLSSON (1938, 1939) — LARMER (1938) — PATTRI (1939) — CHMELAR (1940).

Similar conclusions have been reached, as may well be imagined, by experimenters in those regions of North America where the cultivation of beets is most extensive (SHAW, 1917 — ADAMS, 1926 — LARMER, 1938).

There has been much discussion, over a long period, as to whether it is absolutely necessary, for the production in a plant of the tendency to bolting,

that the temperature should fall below O° C. when germination has reached an advanced stage. This opinion, which prevailed for a long time among agronomists, is not shared in its entirety by some research workers: GUTZEIT, 1907 — GONNERMANN, 1908 and 1909 — NEUMANN, 1910 — MORI, 1925 — PIEKENBROCK, 1928 — KRÜGER, various contributions — CHROBOCZEK, 1934 — BAUER, 1936 — OLSSON, 1938 — VOSS, 1940). PIEKENBROCK observes that in 1927, after the

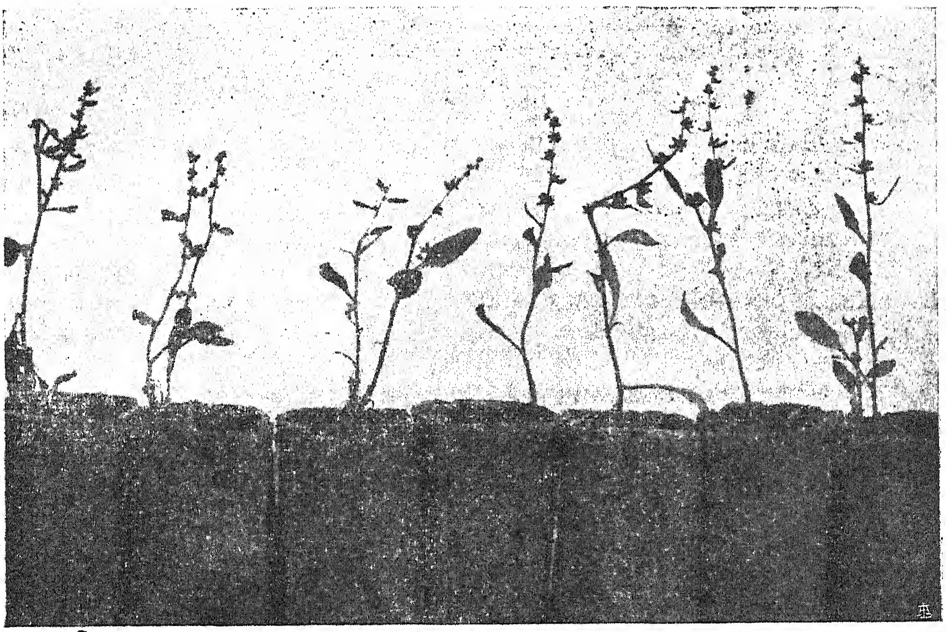

FIG. 5. — Plants of a type with annual balance set to vegetate under the same conditions as the former plants.

first few days of March, the temperature never fell below O° C. in the part of Germany where he was experimenting (as may be seen from the diagrams attached to his monograph); nevertheless in that year the number of plants which ran to seed was relatively high. RIMPAU, on the other hand, who originally admitted (1880) that night frosts must be considered as the only cause for plants bolting during the first year, later (1902) altered his point of view and admitted that other causes must also be taken into consideration. Repeated observations have led us to similar deductions.

According to KNOTT (1925), beets do not run to seed during the first year if germination takes place at a temperature in the neighbourhood of 10° C.

In any case, a prolonged cessation of vegetation, attaining paradoxical conditions, not only does not encourage bolting, but even prevents the production of seed. Important observations in this connection were made by ROSAM (1909) who put beets to grow in small boxes with a minimum amount of soil and was able to keep them in the vegetative state for 26 months. We ourselves, under

similar conditions, succeeded in prolonging the vitality of the plants for more than 2 years without their manifesting any tendency to bear floriferous stalks (Fig. 4); on the other hand, when some of these plants were transplanted, at the end of a year, to ordinary ground where the root system could spread as usual, they ran to seed in the usual way. We also made the following observation: if the progeny has a strong tendency to annuality, then the individuals run to seed even if they are kept in small pots containing a minimum of earth (Fig. 5).

It has recently been thought that a relation might be traced between the influence of low temperature (even above 0° C.) in the production of a tendency to run to seed, on the one hand, and the internal alterations bound up with the process of 'jarovization' or 'vernalization', on the other; but we shall deal with this new and original process in another chapter.

In major crop farming, late sowing would certainly succeed in preventing the appearance of annual plants, but the cure would really be worse than the evil, as is fully confirmed by all those who have given attention to the subject (MALPEAUX, 1913 — RÖMER, 1927 — DECOUX, 1934 — etc.). As regards Germany, RÖMER (1927, p. 167) observes: 'Each day's delay in sowing means a loss of 5 quintals of root crops and 80 kg. of sugar per hectare'. NUDING (1934-35) came to the same conclusions as regards mangolds.

In any case, with the separation of our types with a yearly cycle, which are consequently capable of bolting even after summer sowing, the problem obviously presents itself on other grounds from the theoretic standpoint.

6. Shortening of vegetative period by means of the summer-autumn sowing method

We have already dealt with this question, fairly extensively, in a memoir submitted to the 'Academia dei Lincei' in 1919.

On the other hand, many reports on observations and research work have been published, including the following: BARTOS (1897) — RATH (1911-12) — PLAHN-APPIANI (1911, 1912, 1914) — UZEL (1913) — BARTOS (1914-1915) — DAVERHUT (1916) — SCHNEIDER (1935).

According to some research workers, beets produced from summer-autumn sowings ('Wintersteckling e') would give a larger number of annual plants than beets from spring sowings, while other experts have come to quite opposite conclusions.

Special experiments which we made for the purpose in 1915 and 1916 (cf. 1919 Note), have led us to confirm the second opinion: the number of annual plants was not any greater among the beets produced by summer (August) and autumn (mid-September) sowings than it was among those produced by the spring sowings. For a long time now the method of summer and autumn sowings, for the purpose of obtaining seed-bearers for the following season, has been in practice in every country, including Italy, without any of the dreaded consequences having been observed.

Moreover, mention should be made, in this connection, of STEWART's communication (1929) in which he states that, in order to attain the same end, he adopted another method: sowing under glass at the beginning of December, partial night illumination; transplantation in open fields in the spring, the plants then putting forth floriferous stalks and producing seed in the same year. In this case, however, the method adopted could obviously not be used in ordinary practice.

7. Factors of secondary importance

Apart from the causes described above, which are well-known to have the greatest influence on the phenomenon, there are several others, of secondary importance, which may also, in their turn produce a tendency in the plant to annuality.

(a) *Tendency to annuality in relation to the age of the seed*

Here again research workers are not agreed in their opinions concerning this aspect of the question. According to some, the older the seed, or the weaker its germinative power, the more the plant will show a tendency to run to seed (RIMPAU, 1880 — WESTERMEIER, 1894 — CSERCHATI, 1899 — DEUTSCH, 1906 — HOLLRUNG, 1929). According to others, old seed would produce, on the other hand, individual plants with a decreased tendency to bolting (RÜMKER, 1894 — GONNERMANN, 1908 — HOFFMANN, 1901 — BATESON, 1911 (cf. LAWRENCE, 1937) — BRAUNE, 1923-24 — BASSEGUY, 1940). According to GONNERMANN, individual plants with a greater initial strength are more liable to bolting. BASSEGUY advises that first sowings (over about 1/5 of the total area) be made with between one and two year old seed.

(b) *Tendency to annuality in relation to size of glomerule*

The opinion which prevails as a general rule, according to which small glomerules, and especially those which are formed last on the mother plants, produce weaker individuals, having also a greater tendency to bolting in the first year, finds opposition in the contrary opinion, confirmed by direct observations made by various investigators (WESTERMEIER, 1894 — CSERCHATI, 1899 — HOFFMANN, 1901 — LAWRENCE, 1937). WESTERMEIER correctly remarks that glomerules cannot be confused with seeds in the strict sense of the term, and that there is no direct relation between the size of the glomerules and the weight of the seeds. CSERCHATI quotes data from his own experiments, when at three different periods (March 14, April 16 and May 14) he sowed respectively large and small glomerules from a single lot and obtained absolutely similar results. Observations made by ourselves over a long period have led us to the same conclusions. It is not uncommon to observe that a single glomerule can produce simultaneously normal individuals and others which run to seed (Fig. 6), which confirms the principle according to which individuality is not to be found in the glomerule but in the seed.

Husked glomerules (formerly the practice of husking was prevalent for a period) also produce individuals with a more marked tendency to bolting (GONNERMANN, 1908 — GÜNTHER, 1909 and 1910 — CASSEL, 1919). The last-mentioned author considers that husked glomerules, more easily penetrated by water,

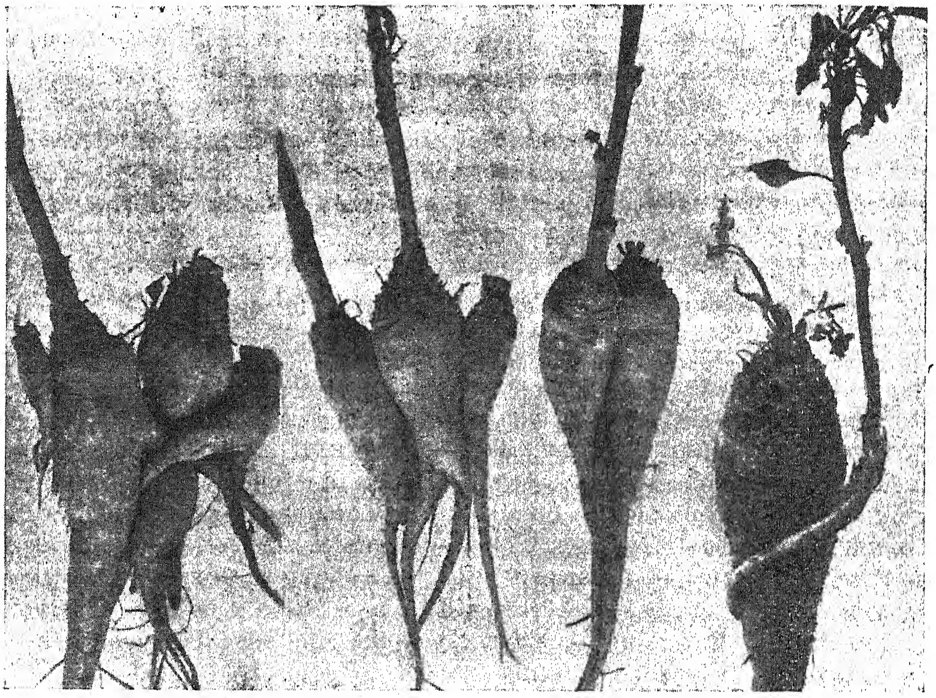

FIG. 6. - Biennial and annual plants produced by the same glomerule.

would germinate more quickly than normal glomerules, and this would explain the greater tendency to bolting observed in the individuals produced by those glomerules.

(c) *Tendency to bolting in relation to cultivation methods*

Excessive depth of sowings would produce, in a certain number of individuals, an increased tendency to bolting: this is the opinion held by RIMPAU (1880), RÜMKER (1894), HOLLRUNG (1907) and CASSEL (1919), though other investigators (CSERCHATI, 1899 — DAVERHUT, 1916), did not come to the same conclusion.

On the other hand, it is unanimously admitted that the density of sowings exercises a distinct influence of its own: the wider the space occupied by the various plants, the greater the number of individual plants which run to seed (BARTOS, 1922-23 — MEIJER, 1930 — ZALESKI, 1932 — PAZLER, 1935 — SPICKA, 1937). If, at the time of thinning out, the best developed and most vigorous plants are left, the tendency to bolting will be increased (DAVERHUT, 1916). This

tendency is lessened if thinning out takes place late. These observations have been constantly confirmed by repeated experiments carried out by us (results not published).

According to ESAU (1934), if the lines of plants are laid out with a northerly exposure the tendency to annuality will be increased.

Persistent drought during the first weeks of vegetation would encourage many individual plants to pass from the vegetative to the reproductive state (WEYDEMANN, 1904 — HOLLRUNG, 1907 — GONNERMANN, 1908 — MALPEAUX and LEFORT, 1908 — NEUMANN, 1910).

On the other hand, it has also be observed that a larger number of plants runs to seed in years in which heavy rains occur (PIEKENBROCK, 1928), or on irrigated land. In this connection, mention should be made of SPICKA's observations (1937); in the case of the Klein Wanzleben beet, 197 plants were observed to run to seed on irrigated land as against 54 on the control plot; in the case of Jaune Eckendorf the numbers were respectively 76 and 11; with Rouge Mammouth, 130 and 38. On the irrigated plots the first annual plants made their appearance at the beginning of July; on the control plots, two weeks later.

In the opinion of several experimenters the tendency to annuality is favoured by wounding or bruising occurring during the first period of the vegetative cycle, as well as by transplantation (RÜMKER, 1894 — CSERCHATI, 1899 — JUHA, 1926). Cuts and bruises to the aerial vegetative system do not, however, have the same effect (JUHA, 1926). In our experiments over a long period (results not published), only once did it happen that we observed the increase of this phenomenon as the definite effect of transplantation, while tests repeated several times at a later date have not led us to equally convincing conclusions. DUVIVIER (1931), in his turn, observed fewer cases of bolting in transplanted beets than in those which have not been transplanted.

There has been some discussion regarding the question as to whether rolling carried out after a night frost does not help to lessen the tendency to bolting, but no definite conclusions have been reached as a result of the experiments made to this end.

It should also be recalled that URBAN and VITEK (1916) carried out experiments in order to establish whether a seed subjected to very low temperatures can produce, in the plants grown from it, a stronger tendency towards a differentiation in the reproductive organs. Results proved negative. The same was true for the experiments made by us in this connection.

8. Behaviour of progeny of beets bolting in the first year

What is the behaviour of progeny from plants which run to seed during the first year? This is yet another aspect of the problem which has been widely discussed ever since ACHARD's time (1809). The first observations made in the course of research work undertaken for the purpose were described by RIMPAU: wishing to verify, among other matters (1876 and 1880), whether the tendency to annuality had possibly increased in the course of several generations, this investigator succeeded in counting, in the fifth generation, 94.7 per cent. of

annual plants as compared with 4.4 per cent. of normal beets. Among later contributions, mention may be made in the first place of BRIEM's observations (1879 and 1902): from seed taken from annual plants in 1878, he obtained in 1879 plants belonging exclusively to the biennial cycle; in his subsequent experiments (1900-1902) on the other hand, seed obtained from annual plants in 1900 produced biennial subjects in 1901 and 19.8 per cent. of annual plants in 1902. LE LAVANDIER (1882), verified a partial transmission of the annual characteristic: he obtained 17 per cent. of annual subjects from annual plants and 0.2 per cent. of annuals from biennials. CSERCHATI (1899), on the other hand, comparing the seed obtained from annual plants with normal seed belonging to the same variety, obtained a much larger number of annuals from the former than from the latter, especially by sowing relatively early. MAERCKER (1899) definitely advises against the use of glomerules from annual plants for sowings under normal conditions. HOFFMANN (1901, 1902) again confirms the tendency to perpetuation of the annual characteristic in the progeny of annual plants but not in as clear and positive a form as does RIMPAU in his observations. PH. DE VILMORIN (1908-1909) states that by sowing glomerules from beets which have run to seed during the first year, 95 per cent. of the plants obtained perpetuate the annual characteristic. From a distillery type beet BLARINGHEM (1912) obtained a proportion of 7 per cent. of annual plants in four generations, although at the outset only 1 per cent. had been obtained. By sowing glomerules of beets which had run to seed in the first year, MALPEAUX (1913) saw the proportion of annual plants rise to 89 per cent. HOLLRUNG (1929) also obtained similar results.

The following conclusion was reached unanimously: When the balance of a type is shifted towards annuality, early sowings and arrested vegetation no longer constitute an essential condition for causing the appearance of a high percentage of plants bolting in the first season. A very late sowing, however, will abruptly lower the proportion of plants which run to seed; in any case no one has succeeded in observing plants bolting during the first season after a summer sowing.

With the collaboration of T. V. ZAPPAROLI we commenced our observations in 1912, following the progeny of a large number of plants through several generations, and we reached the following conclusions (1917):

The disagreement in results obtained by experimenters who have studied the progeny of annual plants obtained from biennial beets may be attributed to the different nature of the original material used by them in their studies concerning the problem of transmissibility of the annual characteristic. There are some annual plants the great majority of whose progeny immediately repeat the tendency to bolting during the first year; there are, on the other hand, plants which run to seed during the first year the progeny of which, under the same conditions, nearly all display the biennial type. Generally speaking, and under similar conditions, beets which run to seed at an early date are more likely to produce annual plants (up to 85 per cent.), while those which bolt later transmit the tendency to produce annual plants in a much less marked degree. The fact of the gradual appearance of bolting and the different behaviour of the habitus

in individuals running to seed at different times during the period of cultivation, had already been remarked upon several times (Bartos, 1897 — Schubart, 1910-11), but a correlation such as we have described had not been foreseen.

Also in connection with the behaviour of the progeny of beets which run to seed in the first season, we continued special research work in collaboration with Dr Costa for the purpose of ascertaining the behaviour, in successive generations, of progeny obtained from annual plants but which do not run to seed during the first year; this is an aspect of the problem which had never before been studied.

9. Search for progeny which do not run to seed during the first season

It is perfectly comprehensible that all the efforts of those who practise selection should have been aimed at separating the strains in which the biennial characteristic was as stable as possible. In this connection, Rimpau, in his memoir published in 1880, made the following correct observations: ' In the separation of his own types, a selector of beets must take account not only of weight, high sugar content and external features, but also of tendency towards bolting '.

Among the very numerous contributions to the study of this difficult problem, special mention may be made of the following: Desprez (1895) — Nowoczek (1895) — Wendenburg (1899) — Schubart (1907-1908) — Bateson (1911: cf. Hall, 1928) — Briem (1912) — Uzel (1913) — Bartos (1922-23) — Rejtharek (1923-24) — Braune (1923-24) — Punnett (1928) — Chmelar (1928) — Dudok van Heel (1929) — Anonymous English author (1931, 1933) — Römer (various contributions) — de Vilmorin (1932) — Zaleski (1932) — Claus (1932, 1936, 1937) — Ducomet (1933) — Chroboczek (1934) — Decoux (1934) — Schneider (1934, 1935, 1938) — Lüdecke (1934) — Esau (1934) — Lebedinsky (1937) — Stehlik (1939) — Voss (1940).

The following is the chief conclusion drawn from the research work carried out some time ago (1911) by Bateson (cf. Hall, p. 230): ' The ordinary stocks of the cultivated varieties of *Beta maritima* – mangolds, sugar beet and garden beet – constitute mixed populations mainly biennial in habit but containing a certain small proportion of individuals which will ' bolt ' under ordinary conditions of sowing in the open. This proportion rises rapidly under conditions favourable to bolting, *e. g.*, early sowing, a check to growth. Sowing under glass at the beginning of the year and transplantation into the open about April will induce upwards of 70 per cent. of the seedlings to bolt. Selection of seed for two or three generations from plants which do not bolt under such forcing conditions gives rise to strains of seed from which the bolting tendency has been so far eliminated that none will bolt under ordinary conditions of sowing in the open or even when forced '.

At the Assembly of the International Institute for Research concerning beets, J. de Vilmorin stated that, by means of very early sowings carried out over several years, he had succeeded in selecting varieties having a minimum tendency to bolting in the first season. Zaleski, on the other hand, stated that,

in his research centre in Poland, he had adopted a similar method: early sowings in highly manured soil with wide spaces between the plants.

It is a well-known fact that the Swedes, who formerly imported beet seeds from Germany and Czechoslovakia, have been compelled to create varieties, such as Hilleshög and Svalöf, better suited to their country. During some large-scale experiments which we carried out in Northern Italy in 1928 (a year which will be remembered in Italy on account of the very large number of annual plants, as already described above), the Hilleshög variety only gave from 3 to 4 per cent. of plants running to seed, as compared with 25, 30 and even 40 per cent. in all ordinary varieties. Further experiments have, moreover, shown that the characteristic of the Hilleshög variety may be considered as practically stable, since continued production through three generations in the Italian climate has in no way altered the special properties of the type. It is therefore logical to infer that cultivation in a northern environment has enabled the selector to eliminate gradually from the system biotypes with the most marked tendency to bolting in the first year.

Latterly, the study of the problem has been directed into other channels as a result of the adoption of the process of 'jarovisation' or 'vernalization'. As regards beets in this connection, mention may be made of the following contributions: LOWIG (1934) — LÜDECKE (1934) — TOLMATCHEF (1934) — CLAUS (1936) — LEBEDINSKY (1937) — FETTER (1938). TOLMATCHEF's is undoubtedly the most original process: the author calls it 'polyfactorial jarovisation', because factors which reinforce each other reciprocally are brought into play: in the first phase, moistening of the glomerules, which are then maintained at a temperature of 0° C. for two months — in the second phase, transport of the material for direct cultivation in Northern Russia. The addition of these two conditions accelerates the process of bolting, which makes it possible to eliminate the biotypes with the strongest tendency to pass from the vegetative to the reproductive phase.

But, despite the efforts expended so far in this field, or those which may be made at a later date, it is impossible to foresee that a certain solution of the problem will be found. Even today the opinion expressed in 1895 by F. DESPREZ has lost neither its significance nor its importance: 'The most strict and systematic selection will never be able to remove this hereditary predisposition'. Exceptionally high proportions of early bolting, such as were also observed a few years ago in England and Sweden (OLSSON, 1938-1939), are a definite confirmation of this.

10. Change in the duration of the cycle produced by cultivation with the aid of continuous illumination

Also in connection with what has been discussed above, the problem of the influence exercised by the environment in which the plant is cultivated, in the sense that it may alter the characteristics of a species, has been studied on broad lines and on an extensive experimental basis by GARNER and ALLARD (1920-23), TURESSON (1922, 1925, 1930-31) and more recently by KAMSHILOV (1939).

It has, on various occasions, been observed that beets run more easily to seed in countries where the days are longer than in southern countries. In 1926 E. SINSKAIA pointed out that the beet cycle in Alaska is usually annual (a complete study of the climate of this country is contained in a comparatively recent work by FITTON, 1930). On the other hand, experiments

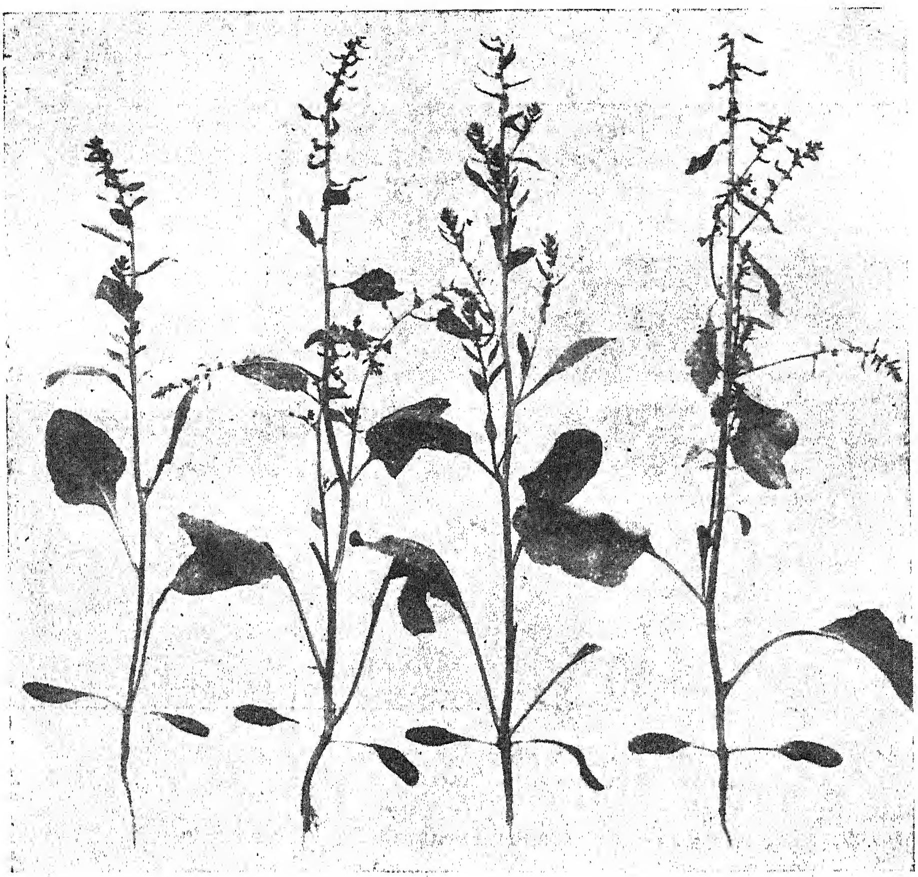

FIG. 7. – Stable annual type, with floriferous stalks put forth 40 days after lifting.

carried out at the Chibini Station (Lat. 67° 44') have led to the observation of the following facts: in ground exposed to constant sunshine (24 hours' daylight), all plants ran to seed the same year and had small thin roots, while other plants, kept under boxes in the dark from 7 p. m. to 7 a. m., remained in the vegetative state and, at the end of the experimental period, showed roots of normal weight.

In less exaggerated conditions of habitat, the Swedes have been obliged, as already stated, to create local types with a minimum tendency to annuality.

The observations made in northern countries led us (1926) to undertake research work for the purpose of determining how plants would behave when grown under glass with natural daylight supplemented by artificial lighting during the night, and the results obtained by this means were absolutely unexpected: at first (1927) it was shown that it is possible to obtain three generations in a single year and later (1929) we found it possible to produce 5 generations in the same period; in each generation the floriferous stalks began to appear three weeks after germination, namely, as soon as the cotyledinous stage was over (Fig. 7).

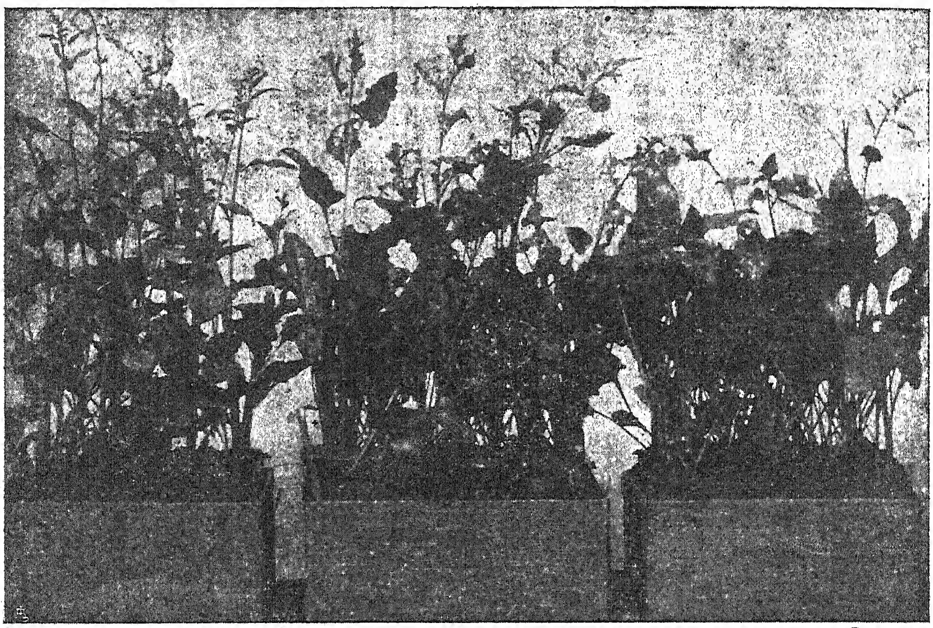

FIG. 8. – Different behaviour of types subjected to continuous light.

Observations have been made in the same field at a later date by: STEWART (1929) — VOSS (various contributions) — CHROBOCZEK (1931 and 1934) — ROBERTS and STRUCKMEYER (1938, 1939) — SMITH (1939) — OWEN, CASNER and STOUT (1940).

After verifying also that, even when grown in constant light, individual plants in a mass do not all run to seed (Fig. 8), the following questions logically came to mind: (1) by adopting this method of cultivation and producing conditions almost similar to those of Northern Europe, would it be possible, starting with individual plants which in each case had not bolted, to separate the progeny with the most stable balance towards ' biennality ' ? — (2) by growing the plants in autumn and winter, or else forcing them under glass in winter, would it be possible to ascertain whether, in the case of certain varieties or types, the tendency to bolting was more or less strong ?

As regards the second question, CHROBOCZEK (1934), VOSS (1938, 1940) and RABIEN (1940) succeeded in perfecting a technique intended to obtain an even more certain diagnosis. According to the method used by VOSS, when the cotyledons appear, the small plants are exposed to a temperature from 1 to 4° C for a period varying from 4 to 8 weeks; they are then put into boxes and exposed to constant light under glass at a temperature varying from 15 to 20° C. According to this author, the number of plants which run to seed under these conditions is no different from the number observed under normal conditions in the open. Taken as a whole, however, facts would lead one to believe that the problem has not yet been definitely solved.

11. Separation of types with a stable annual cycle under conditions of normal cultivation

During further observations which we made concerning cultivation under constant light, we were able, in contrast with the observations made by former experimenters and also by ourselves, to separate types with such a strong tendency towards ' annuality ' that, under conditions of ordinary cultivation, it was possible to obtain a growth of perfectly ripe seed stalks, even when sowing took place in the middle of July or mid-August. Many cultivated and wild types, classified as annuals, remain in the vegetative state when subjected to the conditions described above.

In the case of one of our strains, the tendency to annuality is pressed to such a paradox that the plant is induced to put forth floriferous stalks even before a certain reserve of nutritive elements has been formed in the root; we were, indeed, able to observe (1932) the burgeoning of floriferous stalks and a perfect formation of glomerules when the roots weighed no more than 1 decigram (Fig. 9). The cycle is indeed so rapid that it is possible, under normal environmental conditions, to grow the plant in a simple watery solution in 6 to 8 weeks from the stage of sowing right up to that of bolting (1938).

Lastly, it should be added that with the same strain (see our note dated 1932), it was possible to obtain normal blossoming and a perfect formation of glomerules even in Egypt, where it is considered impossible for the plant to run to seed.

12. Behaviour of progeny obtained from crossing plants belonging to the annual and biennial cycles

There has been repeated discussion (DE VILMORIN, 1923 — DUDOK VAN HEEL, 1927 — HALL, 1928-29 — PUNNETT, 1928) concerning the problem as to whether, when individual plants of the normally biennial cycle are crossed with plants belonging to strains whose balance tends towards annuality, the tendency to bolting during the first year is a dominant or else a recessive characteristic (the terms ' dominant ' and ' recessive ' are, of course, used here in the widest and not in the strictly Mendelian sense). One had to ask oneself, however, if

and up to what point the differences in results and the uncertainties of opinion among the various investigators who have studied the question were to be attributed to the fact that the most suitable material for research might not have

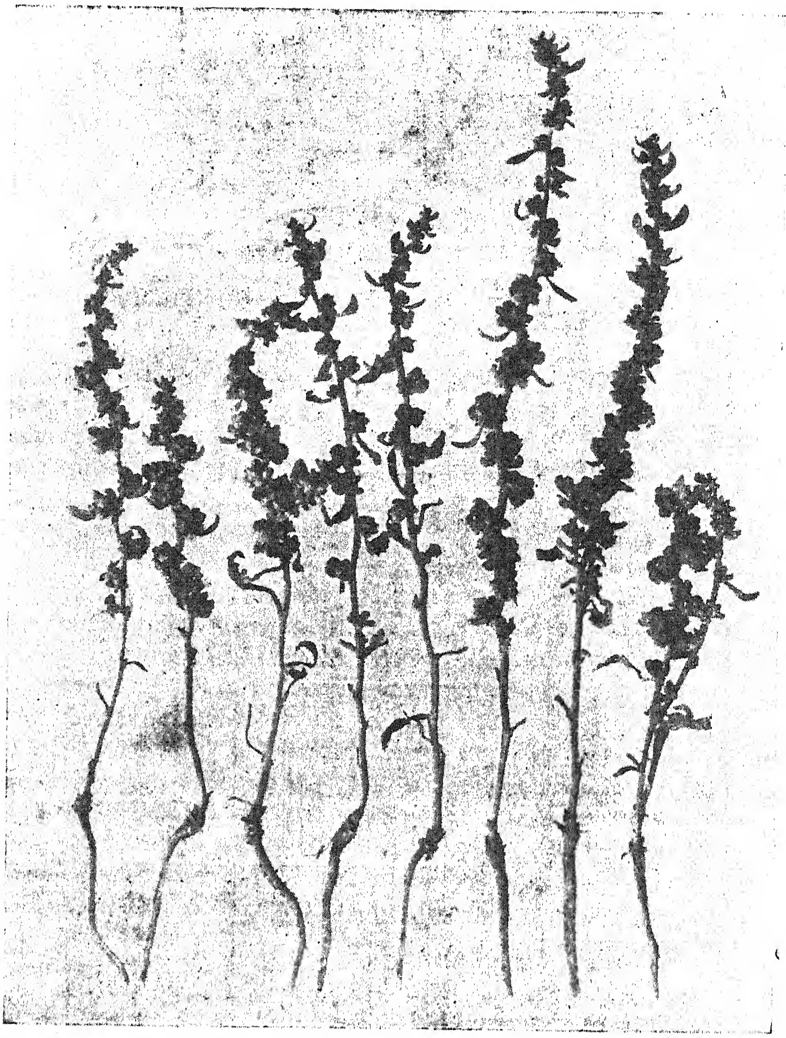

FIG. 9. – Plants of stable annual type which have reached perfect maturity with roots of minimum weight.

been used, owing to the instability of the nature of the question, especially because very often a beet which has run to seed during the first year produces progeny composed of individuals which behave like biennials; hence the difficulty of following the mechanism of facts and, consequently, of interpreting them.

It was therefore only possible to reach the root of the problem by starting from strains such as those we have separated, which possess the faculty of producing 100 per cent. of annual subjects even in the case of summer sowing and by always using seeds resulting from cross-breeding sowing in the late spring, namely at a period when, in the region in question, the individuals of the types cultivated would not be able to run to seed during the first year.

We described the results of our experiments in a brief memoir in 1931, the chief conclusions of which are as follows:

(1) Whether the beet belonging to the annual type is used as the female parent, or whether it is used as the male parent, the tendency to bolting the first year proves clearly dominant.

(2) In the second generation the characteristic of bolting is observed (always using material subjected to experimentation and considering the progeny as a whole) in approximately 75 per cent. of individuals. This is why the tendency to annuality is considered as linked with a simple Mendelian factor.

Several years later our results were amply confirmed by the American geneticians ABEGG (1936), on the one hand, and OWEN, CASNER and STOUT (1940) on the other.

13. Beets which do not run to seed in the second year and power of prolonging duration of the cycle beyond two years

The beet's tendency to remain unproductive the second year has formed the subject of numerous careful studies (as proved by the abundant literature concerning this point); one of the reasons for this is the damage which may be caused in some seasons by this phenomenon in all countries with seed-producing centres.

Among the most important contributions to the study of this problem, we may mention the following: RIMPAU (1880) — NOWOCZEK (1894) — BARTOS (1897) — SCHAAF (1900) — PEGLION (1910) — TRSCHEBINSKI (1910-1913) — GUTZEIT (1912) — SHAW (1917-1918) — PACK (1925-1926) — KRÜGER (various contributions) — CLAUS (1934) — OLSSON (1938).

We know that the fact described above occurs for the most part when the mother roots are transplanted in the late spring. According to KRÜGER, bolting in the second year does not take place when the roots are planted in soil which is poor in nitrogen; but this opinion should only be accepted with a certain reserve (CLAUS, 1934). Repeated observation has always led us to the conclusion that there is no correlation, in our environment at least, between the degree of soil fertility and the failure to produce floriferous stalks.

Normally the subjects which remain in the vegetative state during the second year run to seed in the third year, when, however, it may also happen that new floriferous stalks are put forth by individuals which regularly produced seed in the usual way during the second year. Moreover, matters are complicated because, in the case of certain individuals, the duration of the cycle is prolonged, with regular annual fructification, until the fourth, fifth and even sixth or seventh years (STROHMER, BRIEM and STIFT, various contributions — BRIEM, 1902, 1903 — TRSCHEBINSKI, 1910, 1913 — CRON, 1912) (Fig. 10, on the left).

Lastly, it has been possible to keep a beet in the vegetative state under special conditions (under glass, at a temperature fluctuating between 15° and 20° C., and therefore without any cessation of vegetation in winter), for three and four years and even for longer (KLEBS, 1903, 1906, 1910 — TOWNSEND, cf. SHAW, 1917 — CHROBOCZEK, 1934).

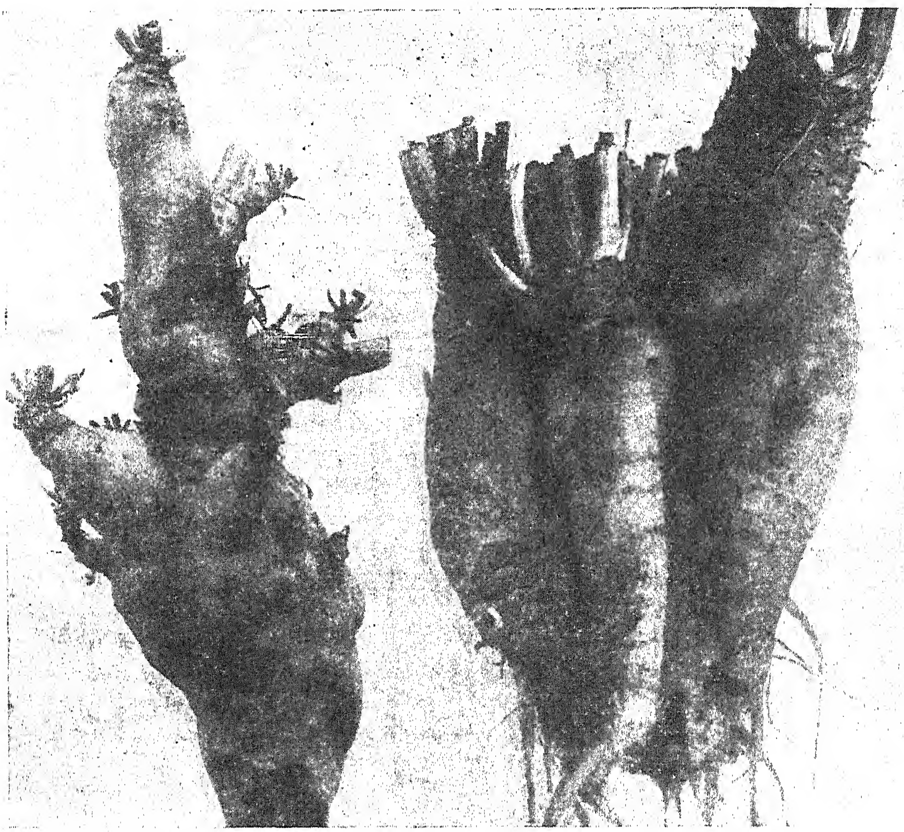

FIG. 10. - *Left:* Pluriannual type — *Right:* Type with neoformations.

Among second and third year beets, it is not unusual to find some plants with more or less apparent neoformations (Fig. 10, on the right), to which various writers have drawn attention and especially BUBAK (1900) and BRIEM (1903), who decomposed a mother beet in its third year, reducing it to several neoformations. We ourselves have also studied the question, as evidenced by the contribution of 1914.

According to RIMPAU (1876, p. 43 and 1880, pp. 199-202), beets which remain unfruitful during the second year, may, after transplantation in the third year, produce seed which is capable of giving its progeny a lesser tendency to annuality; this observation has not, however, received further confirmation.

14. Possibilities of separating strains for autumn sowing for use in large-scale cultivation

In relation to what has been said above, the mere fortuitous appearance in the whole mass of a few plants which do not run to seed in the second year does not suffice; from the point of view of practice, it would indeed be of value to separate strains or lines which, sown in autumn, would produce individuals capable of remaining, if not all at least the majority, in the vegetative state during the spring-summer period of the following year and, at the same time, with the power of resisting winter frosts.

B. NÉMETH worked for a long time to attain this end in Hungary (cf. A. BAUER, 1932 and 1933) and his discoveries have aroused the liveliest interest among experts in this field (SAILLARD, 1931 — CLAUS, various contributions — DECOUX, 1934 — SCHNEIDER, 1935).

Since not even the types known as autumn sowings escape the common lot, there will of necessity be a moment, during the summer-autumn period, when the glomerules put into the ground will produce individuals which will run to seed the next year as though they were 'Winterstecklinge' or 'planchons' for summer sowings. When will it be possible to say that a beet of the 'Németh' type no longer maintains the vegetative habitus and runs to seed as usual? There is only one way of doing this; the seed must be put in the ground at a relatively late date, but then other no less serious disadvantages may be incurred (thinning out due to the indirect action of frost, etc.).

Moreover, a certain reserve must be maintained as regards the possibility of separating frost-resistant strains or biotypes.

In any case, we could not fail to study the question (1932) starting from the consideration that a type for autumn sowings could be widely grown in the more southerly regions of Italy. The same types could also be used for early spring sowings in countries where farmers delay sowings only because they fear that the plants will run heavily to seed, although they know by experience that early sowings usually guarantee better results from the crop.

To conclude, as matters stand at present, the problem cannot be said to have been finally solved.

Summary

(1) Taken as a whole, research work and experiments carried out by a legion of experts, over a period of several decades, in every country where the beet is cultivated, have shown clearly that this plant provides an inexhaustible source of study for geneticians. Possessing extreme ductility, as has often been observed, in which respect it is perhaps unequalled by any other species, whether wild or cultivated, the beet can (as regards the duration of its cycle and ambiental variations), on the one hand, remain in the vegetative state for several years and, on the other, appear with such an extreme tendency to annuality hat it passes from the vegetative to the reproductive phase only a few weeks

after germination, even under normal conditions of cultivation and is even capable, when grown with uninterrupted light, of producing several generations in a single year (up to five generations as checked experimentally).

(2) No process of selection, however, has as yet succeeded in separating strains or types with a definitely biennial balance. Whatever interpretation may be given to the phenomenon (*inter alia*, that which considers beets which have bolted in the first year as mutants destined to guarantee the perpetuation of the species), years with a high percentage of annual plants (such as 1938, typical in England and Sweden, even with the use of strains which had often proved capable of producing, under normal conditions, only a small number of annual plants), have fully confirmed the fact that the tendency to bolting can be restricted, but not suppressed. A similar conclusion must also be reached in connection with selected types for autumn sowings. From the practical point of view, one must therefore consider as not exempt from danger the clause proposed for contracts for the purchase and sale of beet seed, according to which the seller must offer a guarantee that the proportion of plants bolting in the first year will not exceed a given percentage. A clause of this description accepted in the absolute sense and without a calm and considered appreciation of the circumstances which may engender the phenomenon in question, might actually lead to mistakes as regards the origin and qualities of a given seed *.

(3) On the other hand, it is possible to separate strains or types with a stable annual balance from which two generations may be obtained each year, always under normal conditions of cultivation: the first generation is obtained from spring sowing and the second from summer sowing.

(4) Exceptions to the theory according to which the tendency of the cultivated type to bolting in the first year should of necessity be connected with an interruption of vegetation during the early phases of the cycle, are found not only in the fact that it has been possible, as has been shown above, to separate strains which run to seed even after a summer sowing, but also in the evident aptitude of the plant to differentiate its reproductive organs when grown in a hothouse with continuous light. On the other hand, interruption of vegetation extended beyond a given limit causes individuals of the type cultivated to remain in the vegetative state both after early sowing and when cultivated in a very thin substratum of soil (in which case the vegetative state lasted two years). In any case, individual progeny of types with a strong tendency to annuality run to seed regularly even under these conditions.

(5) It is unnecessary for the plant to accumulate reserves in its roots at the outset, since individuals of strains with a stable annual cycle prove capable of bolting and bringing glomerules with normal seeds to complete maturity when they have but recently passed the cotyledinous stage and while their roots are still of minimum weight (1 decigram).

* It should be remarked that the same idea was expressed as long ago as 1896 by E. SAILLARD, in the following terms: ' Beets which have run to seed are not always produced by seeds of unsatisfactory quality '.

(6) When individuals of strains whose equilibrium is definitely shifted towards annuality are crossed with others of ordinary type with a normal biennial cycle, the tendency to annuality is transmitted as a dominant character. From the point of view of practice, this has increased the importance of the counsel to eliminate floriferous stalks of beets which have run to seed among ordinary crops in regions producing seed-bearing beets, in order to avoid possible and undesirable instances of hybridization.

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MISCELLANEOUS INFORMATION

Why are rice yields in tropical regions lower than those obtained in temperate areas?

All agricultural statistics point out the fact—paradoxical to those who imagine tropical countries as being extremely fertile—that the rice yields of extensive rice-growing countries: India, Burma, Indochina, Thailand, the Netherlands Indies, the Philippines, Madagascar, are appreciably lower than those obtained in temperate countries: Italy, Spain, Japan.

The following figures are taken from the Yearbook of Agricultural Statistics for 1940-41. It is enough to cite two series: average yields in quintals of paddy per hectare for the period from 1930-31 to 1934-35 and the yields for the crop year 1939-40.

TABLE I. — *Yield of paddy in quintals per hectare.*

Country	1930-31-1934-35 average	1939-40
(*A*) Tropical countries:		
India	14.3	13.1
Burma	14.4	14.6
Thailand	16.3	15.9
Indochina	10.6	11.9
Philippines	11.3	12.5
Java (irrigated cultivation)	15.7	16.2
Madagascar	12.7	9.0
(*B*) Temperate countries:		
Japan	35.5	40.4
Italy	48.0	48.6
Spain	44.1	41.4

There is a tendency to attribute this inferiority of tropical countries to the agricultural methods employed which are considered as being primitive and ineffectual as compared to those adopted in Europe and Japan. There is, in particular an important factor which comes into play: irrigation; a large part of the irrigated rice-fields of Java, the Philippines, and Ceylon do not receive a sufficient quantity of irrigation water and therefore are partly dependent on the rainfall. It is known, moreover, that the irrigation systems practised in Thailand, Indochina, Burma and India are far from perfect. The rice-fields in Italy and Spain, on the contrary, are entirely independent on the rainfall and obtain all the water necessary through irrigation, while in Japan if the land cannot be given a regular and adequate irrigation it is grown to some other crop. This, however, does not entirely explain the question.

Instead of taking as a basis the average yields obtained in extensive regions, consideration may be turned to delimited regions, known for their good harvests, or else to experiment plots where every endeavour is made to obtain maximum results by choosing the most fertile varieties, giving the optimum dose of fertilizer and by regulating irrigation so that the crop receives the quantity of water necessary for its growth. It is evident that in these two cases, yields much superior to the average are obtained; however, these yields are still lower than the average attained in temperate countries and considerably lower than the yields produced in the best rice regions or those obtained in experiment fields in Italy or Japan.

We reproduce, by way of example and not intended in any way as being complete, some figures taken from the interesting article of M. B. SMITS (1). In determining the yields of rice-fields under regular observation for fiscal purposes, the agricultural advisers came across a most exceptional case—it was a question of one rice-field in a very fertile region and for one crop year—of a yield of 40 qls. per hectare. This exceptional result was only obtained under the best irrigation, fertilizer and soil conditions.

Some time ago a review was given in this Bulletin of the fertilizer experiments carried out in Malaya (2) and, at that time, the maximum yield (see p. 348) was 32.2 qls. per hectare, yield obtained from an experiment plot; with pot experiments, the maximum yields are calculated at 37.7 qls. per hectare.

It would be easy to extend this list of data which all indicate the same fact: yields in tropical countries never exceed a maximum which at the utmost is equal to the average obtained in Japan but which is always inferior to the average in Italy or Spain.

It seems evident, therefore, that the factor, method of cultivation, is not the only explanation. Moreover, it would be incorrect to think that less care is taken in the cultivation of rice in the well cultivated regions of Java or Indochina than in Italy or in Spain. These countries, to cite but one example, have always followed the intensive method of cultivation with transplanting, while in Italy, broadcast sowing has only recently and locally been changed to the transplanting system partly by machine. In determining the factor or factors of environment which come into play, attention may be turned to the soil and to climatological factors.

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(1) SMITS, M. B., Het licht als factor in de productie van rijst. — *Landbouwkundig Tijdschrift*, Wageningen, 1941, 53ste Jaargang, No. 658, pp. 897-906.

(2) BALLY, W., Genetic improvement and manuring of rice in Malaya and British Guiana. — *Monthly Bulletin of Agricultural Science and Practice*, Rome, 1934, Vol. 25, No. 8, pp. 344-357.

The question of choice of varieties does not appear to be so very important. Probably, the natives of the tropical rice-growing countries have known from time immemorial the varieties most suitable for the local climate. The figures available on the yield of selected varieties, always cultivated on a small scale (Indochina, Philippines) are not much superior to the average and, in no case, has it been possible to obtain yields comparable to those of Japan, Italy or Spain.

As regards the soil, it is advisable first of all to take into account its chemical composition, with a view to ascertaining an eventual deficiency in one of the elements necessary for rice, and then the characteristics, physical and chemical, which exert a specific influence on the dvelopment and growth of the roots.

In comparing the chemical composition of the soil of the rice-fields of Java with that of the rice-fields of Japan and Italy, SMITS come to the conclusion that, in most instances, the rice-fields of Java are not any poorer in plant nutrients than those of Italy. In the case of one of the essential elements, N. P, K, being wanting,—frequently, it is a case of phosphorus deficiency— a well balanced fertilizer nearly always adjusts the matter.

In regard to the physical factor, it is found that the marly soils of Java are, in respect of structure, less favourable than the soils of Japan or Italy. For other types of soil, however, those of Java are not inferior to the best found in the other two countries. Aeration is always sufficient.

In Java the chemical composition of the irrigation water, in general, is more suitable for the rice than in Italy. On the whole, the soil factor does not explain the lower yields from tropical rice-fields, especially the Javanese, as compared with the Italian and Japanese rice-fields.

Of the elements which compose the local climate, heat and rainfall are certainly more advantageous in the tropics than in the temperate regions.

There remains a third factor which should be considered as limitative; this is luminosity.

The rôle played by light in the chlorophyll assimilation of plants is well known. There are plants which, for their assimilatory activity, require a strong luminosity —sun plants— and others for which a weak luminosity suffices—shade plants. Rice comes within the first category of plants. Investigators working in different countries have established the influence exercized by light, particularly during the first phases of development, on the growth, increase in weight and the period of flowering anp fructification of rice.

In the Philippines, R. B. ESPINO and F. PANTALEON [1] exposed, for 25 days, rice plants respectively 30 and 15 days old, to five different treatments, namely: (1) Exposure to full sunlight from 6 a. m. to 6 p. m.; (2) exposure to diffused light from 6 a. m. to 6 p. m.; (3) exposure only to morning light from 6 a. m. to midday; (4) exposure only to afternoon light from midday to 6 p. m.; (5) complete darkness. The results of these trials clearly showed that rice requires full sunlight for normal development. The plants of the first series were decidedly superior to those of the other series as regards all the characteristics observed (length of stem, root length, dry weight of stems, dry weight of roots).

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[1] ESPINO, R. B. and PANTALEON, F., Influence of light upon growth and development with special reference to the comparative effects of the morning light and of the afternoon light. — *The Philippine Agriculturist*, Laguna, 1931, Vol. XIX, No. 9, pp. 563-580.

In noting the time of appearance of the inflorescences, L. W. KUILMAN (1), a research worker in Java, had the idea of determining the influence of light on the duration of the vegetative period. He compared 20 varieties under three different conditions, namely: (1) in the rice-field; (2) flooded cultivation with 12 hours light; (3) flooded cultivation with 6 hours light. Thirteen of the varieties reacted to a shortening of the period of light by a contraction in the vegetative period, the other seven, all indigenous, by a prolongation of the vegetative period.

The investigations of the Japanese, M. KONDO, T. OKAMURA, S. ISSHIKI and Y. KASAHARA (2), as well as those of IWAO KAMO (3), the latter referring to Formosa, are much more varied than those of the afore-mentioned workers. They have, in fact, subjected rice plants to every possible and imaginable condition of luminosity, varying either the time of daily exposure or the number of days of treatment. Without going into detail on these studies, it is enough to mention, as general conclusion of these investigations, that the plants subjected to treatment tending to shorten the period of light are early maturing and that the plants subjected to long exposure to light become late maturing. This goes up to complete suppression of the inflorescences in plants exposed continually to light.

M. B. SMITS called attention to the indirect consequences, all unfavourable, of reduced assimilation owing to want of light. It has already been seen that one of the consequences of insufficient light is a delay in root development. The reaction of the stems is not always identical, but it has been established, however, that a want of light stimulates their growth. Of interest is the observation made in Java according to which root rot develops exceedingly if the paddy is planted at the time of the west monsoon (rainy season). This has been explained as being due to a disturbance in the development of the plants in the sense that the growth of the stems is disproportionate to that of the roots. This disturbance, therefore, would be the consequence of reduced light during the wet season. This phenomenon is more serious with soils not very permeable which, in most cases, are deficient in phosphorus. Phosphated fertilizers are considered the best remedy, while nitrogenous fertilizers have a noxious action because they particularly stimulate the growth of the stems.

Mention was also made of the role played by light in the assimilatory activity of the algae which cover the bottom of the rice-fields. Practical workers have long known the favourable influence of the cryptogamic flora (algae, *Azolla*, a floating fern) on the growth of rice, although until now the reason for this has not been exactly determined. SMITH supposes that the oxygen produced by the assimilation of the algae dissolves in the irrigation water and that the oxygen-saturated water penetrates into the soil and thus promotes a better aeration of the land. It is evident that the quantity of oxygen increases with the intensity of assimilation which in turn depends on luminosity. A well aerated soil, on the other hand, constituted the most favourable medium for the development and growth of the roots.

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(1) KUILMAN, L. W., Photoperiodiciteit bij rijst. — *Landbouw*, Buitenzorg, 1937, 13de Jaargang No. 1, pp. 22-29).

(2) KONDO, M., OKAMURA, T., ISSHIKI, S. und KASAHARA, Y., Untersuchungen über ' Photoperiodismus ' der Reispflanzen. — *Berichte des Ohara Instituts für landwirtschaftliche Forschungen*, Kuraschiki, 1932, Band V, Heft 2, S. 243-280, Heft 3, S. 307-330.

(3) IWAO KAMO, Experimental studies on the response of rice plants to length of day. — *The Formosan Agricultural Review* (*Taiwan Noziho*), Taihoku, Taiwan, 1939, Vol. 35, No. 7, pp. 525-545, No. 8, pp. 616-629, No. 9, pp. 671-687.

If insufficiency of light is the explanation of the low yields in tropical rice-fields, this insufficiency should be evident from the photometric observations carried out in the tropics on the one hand, and in the temperate rice-growing regions on the other. Before reproducing the data available, it may be noted that the want of light in the tropics is due to two causes: (1) the shorter days in the tropical regions as compared with the summer days in the temperate countries; (2) the greater number of cloudy days during the wet season of the west monsoon in Java, while the sky is nearly always clear and bright during the rice season in Italy and Spain.

The data collected in Java by SMITS indicate primarily that the yields of 'gadoe' paddy (rice of the dry bright season of the east monsoon) obtained from well irrigated rice-fields are always superior to those of paddy produced in the same region in the wet season of the west monsoon. The difference is considerable, being from 30 to 40 per cent. The number of sunny hours in one of these regions where the dry season is very pronounced has been noted. During the period of growth in the wet season, the number is 900 hours and during the dry season, 1300 hours.

It has also been shown that in a well known region where observations have been made over several years on the yields of the rice-fields and on the luminosity, low production generally coincides with reduced light and inversely.

We will now turn to the observations made in the different rice-growing countries of the world on the number of sunny hours during the rice season. There is some difficulty as the investigators have employed different methods of measurement and recording, so that the data are only comparable after conversion. SMITH, after reducing the data to a common value, estimates the following values as conclusive: (1) number of sunny hours the first month after planting, expressed in percentage of the total number of sunny hours in the first two months. This percentage is considered as favourable when the luminosity of the first month is equal or superior to that of the second month, namely, when it is 50 or over; (2) number of sunny hours indicated by A; (3) number of sunny hours during the first four months, indicated by B; (4) A expressed in percentage of B. In selecting some of the data collected by SMITS, we have assembled in Table II some observations regarding typical stations

TABLE II. — *Number of sunny hours during the rice-growing season.*

Station	Number of sunny hours in the first month expressed in percentage of the total number of the first two months	*A* number of sunny hours during the first two months	*B* number of sunny hours during the first four months	*A* expressed in percentage of *B*
Pekalongan (Java), 'gadoe' rice (dry season)	51	413	818	50
Pekalongan, wet season rice	42	247	612	40
Padang (Sumatra)	45	302	585	52
Fort de Kok (Sumatra)	55	245	506	48
Tonkin (Indochina)	53	328	718	45
Phu Lien (Indochina)	46	342	675	50
Japan, Station situated in the Nord-East	48	404	694	58
Japan, Station placed in the South	48	448	796	56
Formosa, rice planted at the end of June	52	453	785	57
Vercelli (Italy)	50	625	1203	54
Valencia (Spain)	50	723	1364	53

The following conclusions may be drawn from this table:

(1) There is a direct correlation between the number of sunny hours during the rice season and the yield.

(2) The influence of light in the first two months is more pronounced than in the other months.

(3) The theory of correlation between light and yield in rice, as stated by SMITS, seems, therefore, to be confirmed by the data collected in the different regions. It would, however, be useful to continue observations; in particular, it would be desirable if meteorologists were to add to their regular observations those on luminosity (not only the number of sunny hours, but also the spectographic composition of the light is important), and that an international agreement could be made to carry out these observations in all the countries according to the same methods.

Rice cultivation would thus benefit from the new information acquired. Rice varieties will be chosen which, by their character of earliness or lateness according to the case in hand, are the best adapted to the light conditions of the environment. Also, in selecting the time of sowing, account can be taken of the observations on luminosity and sowing effected at the most favourable moment; namely, at a time when there is the best chance of encountering a favourable period of luminosity.

W. B.

BOOK NOTICES *

MALEJEV, V. P., *L'acclimatazione delle piante*. Traduzione di M. SEKADIN, annotata da RAFFAELE CIFERRI, Torino, Giulio Enaudi editore, 1941, 320 pp.

Professor R. Ciferri and the publishers G. Enaudi deserve every praise for the translation into Italian of this work, well known in Russia, but not easily consulted by those interested in other countries owing to the difficulty of the language. The book of V. P. MALEJEV is, in fact, the first modern attempt to treat, from a general viewpoint, the subject of acclimatization of plants, subject which interests every grower in the widest sense of the word, agriculturist, forester or gardener. In his position as-Director of the Botanical Garden of Nikitch in Crimea, working under particularly favourable conditions, in a Mediterranean climate, but not far from the regions of Northern Crimea having a different climate, having easy access to the regions situated at sea level up to an altitude of 1500 metres, the author can amply consider the problem.

By means of numerous branches of science: history, plant physiology, genetics, geography, ecology, the author explains the diversity of the problem of acclimatization, of which so little is known and which, nevertheless, plays an immeasurable part in rural life. Until recently, all that was known was that a plant transported into a new environment underwent changes, that it became acclimatized. In what this process consisted, however, was almost entirely unknown. Exhaustive study regarding the influence of external conditions on the principal vital functions of plants is still necessary to come to a more complete understanding. The genetical study of strains and varieties should at the same time be continued by selecting the forms most adapted to new conditions.

The theoretical and general questions are those chiefly discussed in this work. The examples cited are, for the most part, taken from temperate crops, particularly those growing in a Mediterranean climate. It would have been interesting to extend the subject by citing some cases of tropical plants (cotton, rice, coffee, etc.). There is no index of the names of the plants, which would have increased the value of the book for consultation.

W. B.

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* Under this heading reviews are given of books presented to the Library.

GAROGLIO, Pier Giovanni, *Trattato di enologia; enciclopedia viti-vinicola moderna* Vol. 5. Firenze, « Il progresso Vinicolo ed Oleario », 1942, 1095 pp. (Complete collection of 5 volumes: Lire 350).

The fifth volume of the important work on the vine and wine by Prof. GAROGLIO deals with the chemical and chemico-physical analyses of musts, wines, by-products of wine-making, vinegars and alcohols of vinous matter, as well as with the products the use of which is authorized in œnological work.

All these questions are treated in an exhaustive and masterly way in an interesting text of over a thousand pages. The author adds a series of data and personal experience unpublished to date.

This encyclopedia constitutes a complete, scientific and well documentated work on all the technical, economic and statistical questions regarding viticulture and modern œnology with special reference to the Italian wine-growing problem. The realization of this work which necessitates considerable and attentive labour on the part of the author, filled an urgent need and fully meets the requirements of the technicians concerned, who will find combined and treated together in this encyclopedia all the problems which may arise, as well as new research facts and findings.

We consider it only right to express here our most sincere congratulations to Prof. GAROGLIO for this work which binds his name, in a striking and fecund manner, to the progress of Italian and world œnology.

A. P.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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““# MONTHLY BULLETIN
OF
AGRICULTURAL SCIENCE AND PRACTICE

THE PROBLEM OF WHEAT PRODUCTION IN FRANCE AND IN FRENCH NORTH AFRICA

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Every problem regarding agricultural production comprises economical and demographic conditions, physical and biological data; it includes technical solutions and involves legal and administrative measures of organization, incentive and crop protection. Wheat production in the French Empire (the mother country and North Africa) will be considered under these diverse aspects, which are not independent, as the different factors of production react on each other.

I. — Economic and demographic conditions

General considerations

The primary role which wheat plays in human nutrition depends on its production and distribution, one of the most important international and intercontinental economic problems. The hasty extension in the cultivation of this cereal, during and after the 1914-1918 war, the competition between the producers placed in widely differing conditions as regards production costs, determined a very considerable disequilibrium between production and consumption, a veritable war of tariffs, quotas, dumping, etc.; in fact, an upheaval, the consequences of which did not affect the wheat producers only, as the lowering of the buying power of the farmers had an adverse effect on the industrial and trade activities, the fall in the price of bread did not correspond to the drop in the price of wheat, while the consumers only benefited to a small extent and there was no increase in the consumption of wheat and bread.

It is quite certain that the low price (under cost) given for wheat was one of the decisive factors in the general economic crisis which affected the whole world. The rise in salaries and industrial prices only weakened still more the buying capacity of the farmers, only increased the disproportion between the price of wheat and that of bread, and accentuated State expenses and the ruin of agricultural producers. It well seems that this most serious depression gave proof that *the basis of a normal economy is a prosperous agriculture.*

This deduction has all the more value in that agricultural production holds a more important place in the ensemble of the activities of a country. In France,

the rural population represents nearly half the total population; agricultural production, very varied, constitutes the principal wealth of the nation. The predominance of agriculture is still more marked in North Africa. As regards wheat, the French Empire produces and consumes, on an average, 100 million quintals (soft and hard), namely 1/12 of the world production.

The problems regarding wheat production, considered from the French viewpoint, extend to the metropolitan territory; to Algeria, forming three Departments included in the same economic and customs ring as France; to the Tunisian Protectorate, which also enjoys customs advantages with the mother country for certain products comprising cereals; to the Moroccan Protectorate, subjected to a more international régime by the Act of Algesiras, but to which France grants a certain import quota of wheat in order to maintain conditions favourable to the agricultural development of the country.

In the same market are thus combined: France, densely populated, divided out into a large number of farms, many of which, small in size, are poorly adapted to the use of modern farming practices (1,700,000 wheat producers); countries poorly populated, suitable for considerable extension in grain extension and mechanical cultivation, at least as regards the farms of the settlers. This combination has been found very favourable for the supply of the French market so long as the total production did not exceed requirements; there was a risk of difficulties arising when the increase in production, on the one hand, the reduction in wheat consumption on the other, tended to establish a permanent disequilibrium and to create excess stocks, the utilization of which had to be provided for.

There would be reason for surprise that the price for wheat is the same in France as in North Africa, while the price of land and labour differ greatly. It should be taken into account that the climatic conditions considerably reduce the possibilities of wheat yields in North Africa. The figures given further on for Tunisia indicate, for the period 1931-1935, annual averages of 3.5 quintals for hard wheat, cultivated chiefly by the natives, and 10 quintals for soft wheat; produced mainly by the Europeans, using very satisfactory methods in regard to soil preparation and improvement of varieties. Average yields over 20 quintals are exceptional; they can only be obtained in the best soils, by means of fallow tilled for 15 to 16 months (deep ploughing and some ten surface tillages), which weighs down the crop with increased costs covering a period of two years. Whether cultivation is extensive, as with most of the natives, or intensive as in certain European estates, it results in a cost price per quintal of wheat which is much the same as that which may be taken as the average price in the mother country; moreover, there are the expenses for shipment to a French port to be considered.

In the years preceding the period of present hostilities, wheat production in the French Empire tending to become excessive when harvests were normal or good, it may have seemed desirable to restrict this production, in order not to have to face an exportation made difficult, if not impossible, by the high cost price of wheat in France. At present, without prejudging the future organization of Europe and the relations of the latter with extra-European wheat producers, it seems expedient to reconsider the economic and geographical con-

ditions of French wheat production in view of the trend to be followed in the near future.

To understand the development of wheat cnltivation in the French Empire and its future possibilities, it is necessary to recall some stages in this evolution.

III. — Development of wheat cultivation in the French Empire

Position in 1913

The position in France stood as follows:

Period	Production thousands of qls.	Yield per hectare
1869-1880 (10 years)	74	10.75
1881-1895 (14 »)	83	11.88
1896-1914 (18 »)	88	13.38

The production at that time was inferior to the demand, especially when including the wheat derivatives exported in the form of flour, semolina, Italian pastes, biscuits. etc.

The deficit was covered by imports; these amounted to 7,760,00 quintals on an average per year for the period 1907-1913, of which approximately 1,600,000 from North Africa.

The area under wheat in France then being 6,500,000 hectares, it was sufficient to obtain an increase yield of one quintal per hectare for France to do away with foreign imports. It was reasonable, in view of the advance made in yield in the previous years, to anticipate this result.

Period 1914 to 1922

The situation was entirely upset by the 1914-1918 war, then by the necessity of restoring to a state of cultivation the regions devastated by the hostilities, which regions included some of the most productive. Despite the reincorporation of Alsace-Lorraine into French territory, the area sown to wheat was only 5,382,000 hectares in 1921; it even fell to 5,290,000 hectares in 1922. The average annual production, from 1914 to 1922, stood at about 62,000,000 quintals. During this period, France was obliged to import large quantities of wheat. This situation was only temporary, but it was necessary to remedy it rapidly.

Position in 1923

In January, 1923, a 'National Wheat Week' was held at which the representatives of producers, wheat breeders, merchants, millers and bakers of France and North Africa met.

Its object was thus defined by its organizers: "Inquire after the means of producing in France, together with North Africa, all the wheat required for household consumption and industrial uses, then through combined investigation on the part of producers, milling and baker technicians, bring out the best wheats suitable for meeting the different requirements of the national market".

Some of the conclusions formulated at the end of the congress served as a starting-point for important improvements. Others were belied by later events including those which tended to anticipate a lasting deficit in world wheat production; the situation had to be completely revised less than ten years after.

Panification tests, carried out on the chief varieties of wheat cultivated in France and in North Africa, had shown that the North African wheats, considered as being of better quality than the home wheats, were only superior as regards dryness and specific weight and were not in any way capable of improving baking quality. To what extent could North Africa contribute to the mother country to cover the deficit in production?

The crop of Algeria (average of 15 years) could be estimated at approximately 9 million quintals, including 2½ million qls. of soft wheat, with considerable annual variations due to irregularity in climatic conditions (13,500,000 qls. in 1918, 2,300,000 qls. in 1920). The quantity available for export on an average scarcely exceeds a million quintals.

Tunisia imported wheat or its derivatives up to 1914. A strong effort made during the war and fortunately favourable climatic conditions enabled this country to export annually an average of 200,000 to 300,000 quintals during the period 1915-1922.

Morocco, then in full organization, had to meet increasing requirements and could only contribute a small and irregular quota to France.

It may seem surprising that exports from North Africa did not rise to high figures. The increase in wheat production, in these regions, is mainly the work of settlers and considerably exceeds their own requirements.

In 1922:

in Algeria:						
Europeans	500,000	hectares	of	wheat	4,500,000	quintals
Natives	2,000,000	»	»	»	5,000,000	»
in Tunisia:						
Europeans	75,000	»	»	»	700,000	»
Natives	500,000	»	»	»	1,200,000	»

But the production of the settlers in wheat (and in other food products, excluding wine) is to a large extent absorbed through native consumption; this has stimulated appreciably the increase of the native population, by reducing the years af scarcity, as well as by giving work and purchasing power to many of the natives, formerly undernourished. " It may estimated — wrote in his report presented on occasion of the National Wheat Week (1923), one of the representatives of Algeria, M. Bories—that the European population of Algeria, which now numbers 830,000 (1921 census), in 50 years will not be much over 1,200,000, while in every probability, the Arab population, which totalled 2,382,000 in 1856, 4,967,000 in 1921, will attain, within 50 years, some ten million ".

Attention should be given to this eventuality by the Governments, as it will only be possible, in the future, to meet the increasing requirements of the native population in wheat by inducing the natives to abandon their archaic methods of cultivation, which is a difficult task when it is considered the little progress made in native agriculture since French occupatian.

It may be added that the production of hard wheats only interests France for an available quantity of about 2 and a half million quintals which represents the requirements of the mother country for the manufacture of semolina and wheaten pastes.

In brief, it could be said that in 1923, North Africa had more or less solved the problem of its own wheat consumption and that France, still with a deficit, even with the contribution of 2 to 3 million quintals from North Africa, tended to retrieve its position and meet its own requirements. The 1921 harvest attained 88 millions quintals, showing the possibility of returning to normal production which was 88 million quintals for the pre-war period 1896-1914. The home requirements then stood at 92 million quintals of soft wheat, plus 2 and a half million quintals of hard wheat supplied from North Africa. It is true that to these home requirements could be added the quantities of wheat necessary for the production of flours, semolina, pastes, etc., intended for export. The output capacity of the French mills is approximately 130 million quintals, but it was prudent not to be too confident about export possibilities in a slightly remote future.

At the end of the meetings held during the National Wheet Week, we were led to conclude that, in so far as regards Tunisia which we represented, that this country, which at that time was making a great effort in colonization, and where, the production of wheat was increasing, could only continue to export its surplus to the French market if production were directed towards strong soft wheats, this category of wheats being imported, indispensable for the improvement of French flours, being imported each year, even when the harvest showed a surplus. It is imagined that as long as the French crop was inferior to the demand, the chief preoccupation of the plant breeders had been to obtain higher yield; the question of quality, more exactly the strength of the wheats, being accessory and even overlooked; moreover, at that time, there were no means of measuring and expressing it; the millers complained of the often insufficient content of gluten in the wheats and its mediocre quality.

The problem of creating strong wheats regarded all North Africa; its study was undertaken and satisfactorily solved first by the Botanical and Agronomic Service of Tunisia, and subsequently in Morocco and Algeria.

Situation in 1938

(1) In France. — From 1923 to 1938, the area grown to wheat decreased from 5,533,000 ha. (1923) to 5,050,000 ha. (1938), which decidedly indicates the tendency to replace wheat by other crops requiring less labour, often by grassland and pasturage, consequence of the social measures attracting the rural population to the towns and industries, of an increase in the consumption of animal products and of a very marked drop in bread consumption. Figures for production and yield are given in the following table:

Period	Average production million quintals	Yield per hectare in quintals
1923-1928 (6 years)	76	14.04
1929-1933 (5 years)	83	15.40
1934-1938 (5 years)	81	15.60

Like all averages, these figures only have a theoretical value: the examination of the annual harvests indicates greater possibilities in yield and production.

It seems possible to come up to a sown area of 5,250,000 hectares, the average of the last five years being close to this figure.

Yields attained 16.6 in 1932, 18.04 in 1933, 17.05 in 1934, 19.41 in 1938; the stabilization of the average yield at 17.5 would give an average production of 90 to 92 million quintals, which is not a generous estimation as the three successive years 1932-1933-1934 yielded an average production of 94 million quintals, the best year being 1933, with 98,600,000 quintals.

In 1938, therefore, it was necessary to anticipate the eventuality of the harvests exceeding 90 million quintals and five-year averages varying around 80 million quintals, while the fall in the consumption of bread, estimated at approximately 25 per cent. compared with 1922, and the reduction in area sown as well as that in the export of wheaten products, diminished the wheat requirements of France. A surplus stock of about 20 million quintals weighed down the market and its reabsorption was not easy for the public authorities.

The conclusion is that the French wheat production tends to become excessive and that this fact must be taken into account in establishing a sound wheat policy.

(2) In North Africa. — In Algeria, the wheat production averages 9 million quintals hard wheat and 2.5 million quintals soft wheat. Production has not increased much since 1923 and the greater part of the crop is consumed in the country itself. Exports consist chiefly of hard wheats and strong soft wheats, altogether not exceeding 2 to 3 million quintals on a average.

In Tunisia, which has not the possibility, like its neighbour, of expansion in wine-growing, the advance in wheat production was much more rapid, as the following figures (five-year averages) show:

Period	Area		Production		Total exports
	Hard wheat	Soft wheat	Hard wheat	Soft wheat	
	Ha.	Ha.	qls.	qls.	qls.
1919-1923	507,000	47,000	1,563,000	337,000	300,000
1926-1930	642,000	68,000	2,514,000	618,000	876,000
1934-1938	594,000	139,000	2,280,000	1,580,000	1,100,000

At present, Tunisia disposes, for exportation to France, in a normal crop year, of nearly 2 million quintals made up of more or less equal parts of hard wheats and strong soft wheats.

In Morocco, the cultivation of soft wheats has increased considerably as it is largely practised by the natives. The local consumption has increased to an equal degree and the quotas granted by France have practically absorbed the surplus available.

North Africa supplies France with 5 to 6 million quintals of wheat which meet French requirements in hard wheats and strong soft wheats, production supplementary to that of the mother country and which have replaced foreign imports.

III. — Technical problems

There is no need to demonstrate the role of technique in wheat production and in the lowering of production costs. It is to the problems still to be solved in France that we wish to call attention, by expounding the present situation and the improvements to be realized. Their solution is often complex and necessitates several years of work; the abnormal circumstances of the moment will undoubtedly make it necessary to postpone taking into consideration important recommendations because they are temporarily irrealizable or because precedence has to be given to emergency measures. We think it expedient to consider from now onwards a general program of the improvements to be made in the wheat production of the French Empire, as co-operation towards the new economic balance of Europe. The longer it takes for the results of a solution to have effect, the more important it is to take this solution without delay and start putting it into execution.

The improvement and organization of wheat production may be considered from different standpoints:—

action on the factors of quantitative production:

area sown and land improvement; natural fertility of the soil, fertilizers, cultivation methods;

productivity of the different varieties;

resistance of varieties to adverse weather conditions and to diseases;

adaptation of varieties to environment;

qualitative improvement:

adaptation to the requirements of the local milling and baking trade and to the desiderata of eventual importers;

regional equilibrium of varieties of different qualities;

economic realization of the possibilities of progress:

controlled production of pure varieties;

valorization of the crop with a view to its better utilization, grading and standardization.

Distinction should be made between the improvements carried out by the producer and those where the expenses are incumbent on groups or associations or on the State.

Finally it is advisable to specify the respective roles of:

official stations and private enterprises in regard to the creation of improved varieties;

producers and their associations;

and of the State;

in the collective work of improvement and organization of wheat production and utilization.

Area under wheat – land improvement

The area grown to wheat in France, during the decennial period 1930-1939, varied from 5,464,000 ha. in 1933 to 4,584,000 ha. in 1939. This latter figure is abnormally low owing to the destruction of an appreciable part of the autumn

sowings through frost and the impossibility of fully making good this loss by the spring sowings. The year 1938, with an area of 5,050,000 ha. also experienced the effects of severe frosts which destroyed more than a million hectares of wheat which could not be completely resown. Such serious damage caused through frost, in two successive years, is rare; however, account should be taken of similar eventualities, and it may be taken that the area normally grown to wheat, in France, during the last ten-year period before hostilities, was between 5,250,000 and 5,500,000 ha. This area amounted to 7 million hectares in 1870 and in 1890, which indicates a decrease in the land sown to wheat, the main causes being the suppression of wheat cultivation in regions not very suitable for the crop, the fall in the consumption of bread and the reduction in the rural population closely bound up with the production of wheat necessary for its maintenance. These causes are permanent and their effects should not be considered as temporary. On the other hand, the reduction in area has not had any serious consequence on production owing to the improvement in unit yield.

An increase in the area grown to wheat does not appear very probable; it cannot be considered as desirable as it would extend to land not suitable for this crop and would be made to the detriment of other very useful crops, still insufficient to meet the requirements of the country. It is even less probable to find wheat land by putting untilled ground into cultivation; the area of this ground, moreover, is far from attaining the figures given by incorrectly informed publications.

The most fruitful endeavour in regard to wheat lands would consist in the improvement of some of these thorough land improvement measures (drainage, irrigation). " About 1900, it was estimated that 4 million hectares in France should be drained ... The State has just raised to 60 per cent. the maximum of participation in the costs of these improvements ". (Augé-Laribé) ([1]).

Drainage work, which was carried out at the rate of 2 to 3,000 hectares per year, should be accelerated.

Irrigation is reserved mainly for crops producing a large gross yield per hectare (truck and shrub crops). It is only profitable for wheat if it is a question of a small area.

In North Africa it is still possible to ' make land ' and increase wheat cultivation appreciably; there are considerable areas covered with brush which can be cleared (in Tunisia, between 1922 and 1930, approximately 5,000 ha. were cleared a year, 9/10 being due to the initiative of the settlers).

Moreover, much of the land worked by the natives have clumps of jujube-trees, mastic-trees and palmetto, which reduce the utilizable area. The natural indolence of the rural population, the insufficiency of their resources, the land régime are the chief causes of this situation which is deplored by all who know the agricultural value of these lands when they are properly cultivated. Undoubtedly it will be necessary to clear these stagnant lands and to abandon the archaic

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([1]) Situation of French agriculture, 1930-1939. Its capacity of development, its part in national trade. Paris; 1941.

methods of cultivation, if only to enable the natives to meet their own requirements in wheat.

By means of primitive hydraulic works and installations, enabling the agricultural utilization of streams, underground water near the surface, overflow from the wadis, the natives, grouped into irrigation associations, and some settlers, have fertilized various zones where the rainfall is insufficient (the natives are frequently very ingenious in their utilization of water). The colonizers have added to these modest means Artesian wells and large dams; here again, irrigation for cereals is only profitable if obtained at a low cost.

Land improvements, with the exception of clearing, are chiefly carried out by cooperative or syndical associations, with the financial partecipation of the State and the assistance of the Service of agricultural engineering.

SOIL FERTILITY – FERTILIZERS – CULTIVATION METHODS

The *nature* of good *wheat soil* naturally varies according to climate; wheat is grown on widely differing soils, which fact would give the impression that this cereal had no very marked agrological preference. The farmer who is unable to select the land to be sown to wheat, can improve considerably the land available by acting, through working the land, on their physical and even chemical properties and, through fertilizers, on the stock of nutrients placed at the disposal of the plants.

The soil contains reserves of water and nutrients; the aim of all cultural operations is to obtain the optimum conditions of moisture and fertility. Coarse sandy or gritty soil with a low water-retaining capacity, are only suitable for wheat cultivation in humid, rainy regions. The more southern and subject to dryness the land, the greater the necessity of reserving for wheat finely-divided, clayey- calcareous, deep soils, provided that their water supply is assured by means of rotation and appropriate working.

In France, very considerable research work has been carried out on the *factors of soil fertility* and *fertilizers*. It would be useful to make a synthesis and to establish regionally the characteristics of farm land and the nature of the elements of fertility the contribution of which is efficacious. The result would be a more discerning use of fertilizers, and it is more important than ever to obtain the maximum efficacy and to avoid all waste [1].

A comprehensive work would necessitate the development of installations of experiment crops in movable vats, until now on too small a scale, and the organization of a network of comparative fertilizer test fields, coordinated with comparative variety tests, already mentioned. A fertilizer experiment limited to one variety only gives a partial particular result, not generalizable. An ensemble of results, obtained with different varieties and different soils, may be interpreted statistically and lead to some conclusion.

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[1] Rapid soil analysis methods are now used to generalize this knowledge of the soils of France.

The effect of cultivation methods on the utilization and loss of the fertility elements would be worth while studying; effects on nitrification, on the fixation of nitrogen, the loss of nitrates in the infiltration water, the utilization of fertilizers, specially of phosphates which circulate very little in the soil, etc.

Studies on soil fertility are incumbent on the official Service of Agricultural Research; their development would involve some expense, but would be an effectual factor in the more rational use of fertilizers and an increase in the unit yield of wheat.

Another most important factor regarding this yield is the volume of soil in which the wheat can develop its roots; these can only penetrate into a light and a moderately moist soil; their development stops on reaching hardpan or layers impermeable to water. Under optimum conditions the arable layer, from 0 to 25 cm., only contains about 50 per cent. of the roots, the remainder descend to over 1.50 m. in depth. The utilization of an essential cube of soil conditions high yields and resistance to drought.

In North Africa, the putting into effect of a *rational working of the soil*, in the course of the last twenty years, has increased considerably soil fertility and yields; all its efficacy has been given to the improvement of wheat varieties; it only remains to generalize these methods to the extent of the means available (teams, fuel for tractors, etc,). Deep ploughing is, according to the picturesque expression of the settlers, the way to increase an estate without changing its bounds.

The scope of the progress realizable in this sense in France is probably considerably reduced in the regions of intensive cultivation, where the preceding crops of wheat (beets, potatoes) also necessitate deep working of the soil; certainly it is still possible in the southern half of the country and the agricultural research Services will find there material for work of great practical importance.

Special attention should also be given to the control of weeds, the competition of which to the wheat crop leads to losses which are frequently underestimated. The practice of tilled fallow (8 to 12 dressings) realizing the ideal 'neither clods nor weeds' has given the best results in North Africa, where the object is also to constitute a satisfactory supply of water. This system can only be applied in exceptional cases in France, to badly infested land; it is chiefly to root crops and forage plants that recourse should be made, as well as to selective chemical weedicides, the use of which, unfortunately, is difficult in small farms, unless they group their requirements and means together cooperatively for the purchase of the material and the execution of spraying or dusting operations.

IMPROVEMENT OF VARIETIES: PRODUCTIVITY, RESISTANCE TO ADVERSE WEATHER CONDITIONS AND TO PARASITES

Selection and hybridization, very efficacious means of improving wheat varieties, have been extensively put into operation in France and in French North Africa and valuable results have been obtained.

In France, a large number of private enterprises for the selection and improvement of cultivated plants have created wheat varieties marking appreciable progress in regard to productivity and industrial value.

Although there was an evident national interest to endow agriculture with selected varieties, the State for a long time prohibited the creation of new varieties. One can only turn to official selection and improvement stations, free from all commercial activities, to establish and to realize a comprehensive program for the entire country. This abnormal situation was revised; numerous varieties (pure lines) are being studied at the State Stations; this trend which is the true justification of these stations, is to be developed according to a plan taking into account the desiderata which have not yet been realized or which have been disregarded. France now has wheat varieties much more productive than those cultivated 25 years ago; from the industrial standpoint, their qualities are still very variable as will be shown further on.

A fact which cannot but be found astounding indicates the way to follow for the required improvements: the average yield of wheat in France has not augmented proportionally to the increase in the productivity of the varieties. The figures given previously indicate an advance in unit yield of about a quintal and a half between the periods 1923-1928 and 1934-1938; further, it must be taken into account that the reduction in sown areas has chiefly affected lands with a low yield. The reasons for this variance are: slowness in the diffusion of good varieties, insufficiency of the adaptation of these varieties to the different regions of the country, the excessive susceptibility of these varieties to frost and to cryptogamic diseases, all causes of considerable irregularity in harvests which affects the average yield. The 1933 crop amounted to 18 quintals, proof of the productive qualities of the varieties cultivated and the possibilties of increasing appreciably the production of French wheats by the obtaining of varieties more resistant to adverse weather conditions and to diseases.

The disastrous consequences of the winter frost of 1938-1939 and 1939-1940 showed appreciable differences in the resistance of varieties to frost, but the solution of the problem is still far from complete. It will doubtless be impossible to find it in the selection of varietées sufficiently resistant, because the severity of the winter varies from one year to another; it is expedient to consider in a parallel way another solution, that of replacing the destroyed winter wheats by late sowings of alternate wheats and spring varieties. The experience of the two afore-mentioned years has shown that while we possess a whole range of good alternate wheats, we are inadequately supplied with true spring wheats.

We are also, in the large scale production regions, wanting in early maturing autumn varieties, which would make it possible to space out the harvesting over a longer period, thus favouring a better utilization of material and labour. Earliness and high productivity are not inconsistent as the results obtained in North Africa show.

The creation of varieties resistant to smut and rusts, these terrible parasites of wheats, which, some years, cause veritable disasters, does not appear to have been proceeded with systematically by the utilization of specifically very resistant parent plants such as the American hybrids Marquillo, Minnesota 2.303, Thatcher Hope, H-44-34, etc.

The French plant breeders, moreover, have a tendency to limit the choice of the parent plants too closely to the forms of western Europe, while the intro-

duction of genes from distant regions would supply a very diversified material enabling progress of the greatest amplitude. This tendency holds to the opinion, for us unfounded, that the two parent plants should be adapted to the environment. It is sufficient for one of the parent plants to be adapted for one to expect to obtain one or several interesting combinations of genes. It is easy to ascertain that all the French wheats which show an appreciable improvement in their 'strength' quality (W in Chopin formula) possess in their lineage an ancestor originating in eastern Europe or in the Indies; it would be more effectual to introduce directly a parent plant imported from these regions; much time and effort have been wasted in realizing hybridizations between local varieties, which can only but produce already existing combinations of genes. It may be noted that the production of strong wheats in North Africa has been rapidly realized through the use of parent plants from India; that of wheats, soft and hard, early and very productive is also the result of hybridizations with foreign parent plants.

France has only slowly made a place, still inadequate, for genetical work and instruction in the science of genetics. There cannot be too much attention called to this delay, detrimental to the improvement of all our cultivated plants. The North African Frenchman has, in this respect, outstripped the mother country and, due to this initiative, has realized an extensive and rapid improvement in his agricultural production, more particularly as regards wheat, and has proved that the qualities of productivity, earliness and 'strength' are perfectly compatible and not antagonistic.

In North Africa, only the official stations carry out improvement work on cultivated plants. In France, a concerted action between the State stations and private enterprises should enable very extensive and rapid progress to be made. The number of these stations is fairly high in the northern half of France, where, moreover, progress is most evident; the stations are certainly insufficient in the southern half, where much remains to be done to supply wheat varieties of good quality, adapted to the special conditions of soil and climate.

It is not necessary for the plant improvement stations to be very numerous, but it is necessary that they should be judiciously distributed throughout the entire territory, that they dispose of adequate means as regards land, laboratories, material and personnel and that they work for the realization of a concerted program.

Our personal experience has enabled us to ascertain that the efficacy of the work and investigations of a station are considerably increased if the station in question is prepared not only to maintain the pure stocks bred there, but also to supply seed, in appreciable quantities, to the breeders placed under its control. The management of a station which thus possesses its own resources implies the attribution to this station of civil bodies, with financial autonomy. This system has given proof of its efficacy in North Africa, where it is generalized in many State establishments. Since we are in the era of reform, it would be desirable to obtain this decentralization of the management of plant improvement stations.

The advantages of the cultivation of pure strains of wheat should not be forgotten.

Pure strains have clearly defined requirements; the knowledge of these requirements enables a proper regional adaptation of varieties, the adoption of wide

range varieties only slightly susceptible to environment, an exact interpretation of all experiment and cultivation work.

Pure lines show great uniformity in growth, condition favourable to yield, great uniformity as regards adverse weather conditions and diseases, so much so that the cultivation of resistant strains constitutes a very effectnal means of protection against these adversities.

Only pure strains give a product of definite quality. It thus becomes possible to study the variability of yield and quality under the influence of environment; to classify wheats, according to their baking value first by strain, then origin and to seek suitable markets for the different types.

These advantages have such a practical importance (cultural, commercial and industrial), that it is to be hoped that the cultivation of pure strains of wheat will become general, counter to the conception still cherished by many practical workers that the best yields are obtained by cultivating mixtures of pure varieties of 'country wheats' formed of more or less mixed populations.

The cultivation of a mixture of varieties is not an assurance against risks due to climatic conditions, it is simply an assurance against the hazard of making a poor selection; the modalities for a judicious choice of wheat varieties are indicated in the following paragraph. The division of risks and also of the work is obtained by sowing, separately, in a farm, strains of varying maturity, thus spacing out the sowings, critical periods for vegetation, and harvests.

Although all these advantages, of primary importance, do not impose on the wheat producers other expense than the purchase and periodical renewal of seed, the cultivation of pure lines of wheat is far from general in France. The renewal of seed could be deferred longer if every farmer pledged himself to set aside, for the production of the seed he requires each year, a field on which he would concentrate every care: soil preparation, fertilizers, removal of weeds, smutty plants and especially of forms foreign to the variety, introduced accidentally. A sufficient purity (99 per cent.) may thus be maintained for many years.

Adaptation of varieties to environment – Comparative Experiments.

The good adaptation of varieties to environment is one of the best means of regulating yields, of reducing to a minimum the hazards which the crop runs through poor weather conditions and other adverse circumstances. The local varieties (country wheats) are the result of a long natural selection among the numerous forms (genotypes) which constitute them; the knowledge of their behaviour in regard to soil and climate is the consequence of observations of centuries sometimes. The strains, obtained by genealogical selection with or without hybridization, from the fact that they are constituted by one genotype only have well defined requirements which should be met by the environment for their aptitudes under the double connexion of quantitative yield and quality to be manifested. Therefore, it is of primary importance to determine experimentally the range of cultivation of each new variety, to compare it with the varieties formerly cultivated, from the standpoint of their cultural aptitudes and their baking quality.

The comparison of varieties is the most delicate problem in plant improvement. It requires a special technique, repeated experiments, therefore numerous experiment plots where the results have to be compared and coordinated; this is to say that the farmers cannot be left to experiment with new varieties, before fixing their choice, without exposing them to the risk of too hasty and unwarranted conclusions; it is the task of the State to realize this comparative work.

All isolated experiments, moreover, give results which are only valid for the particular conditions under which they are obtained. The agricultural environment being especially varied and heterogeneous, agricultural experimentation, whether it is applied to varieties, fertilizers, cultivation methods, treatments, etc., requires comparative tests carried out in different regions, over several, years, furnishing a series of results which it is advisable to interpret by statistical methods in order to determine the degree of import or reliance.

It is also possible, and necessary, to combine, in each experiment, the study of several factors of production, in order to estimate, not only the separate effects, but, at the same time, the reactions. A comparative test on varieties, even under diverse situations, is incomplete, if it does not include the determination of the response of these varieties to different formulae and doses of fertilizers; in the same way, a fertilizer experiment limited to only one variety only gives a partial result.

There cannot be too much stress laid on *the absolute necessity of regional adaptation of wheat varieties* as also of every new strain of cultivated plant and of every cultivation practice. All countries anxious to develop their agricultural production harmoniously possess an *official system of comparative experiment fields,* because it is the sole effectual means of putting each variety in its right place and obtaining maximum yield.

It is necessary to make an effort in France in this respect; moreover, it is much more a question of the organization and coordination of the existing resources than of innovation. The plant improvement stations and the agronomic stations should combine their work instead of dealing with it separately; the former on varieties and the latter on soils and fertilizers. The national and regional centres of agricultural experimentation should form part of the same system or network of comparative experiments, which could also be effected on the farms of agricultural instruction establishments. Finally, there would be considerable advantage in interesting the cooperative associations of wheat producers in this organization. The example given by the Federation of the cooperative groups of the wheat producers of Seine-et-Oise, in collaboration with the central Station for plant improvement at Versailles, shows the comprehension which may be found in agricultural associations. The comparative experiment fields constitute an excellent means of interesting the farmers in the progress made in agricultural technique and of establishing a bond, highly desirable, between the laboratories and stations and the élite of the agricultural world.

Then insufficiency of comparative experiments in France well appears to be one of the principal causes of the slowness in the propagation of new varieties and even of other agricultural improvements. We are sure that it is due

to the comparative experiment fields (some fifteen), which have been in operation in Tunisia since 1910, that the improvements in cereal production in this country have been rapidly realized. The Botanical and Agronomic Service of Tunisia assures the sowing and harvesting of these fields and collects all useful information therefrom. Expenses are met by the Central Cooperative of wheat producers.

One of the important advantages of comparative experiments is to make known the varieties which can be grown over a very wide area. The adoption of these varieties, the least susceptible to changes in soil and climatic conditions, with a more regular yield and, therefore, higher, makes it possible to reduce to a minimum the number of cultivated varieties, which simplifies appreciably the grading and the full utilization of the crop.

Qualitative improvement of wheats

The conception of quality of wheat is much more complex and more difficult to express than that of quantitative yield. For soft wheats, which are used chiefly in bread-making, their aptitude for panification is readily designated as baking value. This cannot be exact for the following reasons:

(1) The evaluation of bread quality is subjective and varies from one consumer to another; it is arbitrary for all organoleptic characteristics and is expressed by a notation itself arbitrary.

(2) Two successive panifications of the same flour do not give identical results.

(3) The baker evaluates different factors of baking value from the consumer, those which condition the operation of panification.

This operation brings into use two essential properties of flour: the plastic properties of the dough, which come from the quantity and quality of the gluten and the amylolytic power, action of the β-amylase of the flour which transforms the starch into fermentable sugar under the effect of yeast. These are the properties, moreover, which, with the technique of the baker, condition the quality of the bread.

It is possible to correct the insufficiency, rare, of the amylolytic power and the fermentable quantity; however, the means of compensating poor plastic qualities by the use of bromates and persulphates which opposes the action of the proteolytic ferments on the gluten ferments are prohibited in France.

The standard flours accepted in the baker's trade are obtained by milling a mixture of wheats of different 'strength', designating under this name the ensemble of plastic qualities. 'Strength' is the chief qualitative characteristic of wheats; the term baking value should be reserved for flour.

Strength is a property peculiar to each wheat variety and wheats can be classified according to strength which governs their utilization in mixtures. This strength is hereditary, but its manifestation, like that of all the characteristics of living organisms, depends on environment; favourable and unfavourable circumstances govern its manifestation, but this variability does not change the grading of wheats cultivated in a given region.

There are various laboratory methods for determining and expressing numerically the plastic qualities of wheat flour dough; moreover, they show a fairly marked correlation. Im France, the system used in commerce and in industry is the Chopin method which calculates, on a test piece of dough with a constant hydration rate, blown up to bursting point, the following indices:

P = maximum pression, expressing tenacity;
G = swelling, square root of the volume of the bubble at the time of bursting, expressing extensibility;
W = work effected by the extension of the dough.

When G is normal (18-22), strength is generally expressed only by the value W.

By utilizing the W values which had been determined for the wheats cultivated at the experiment Centres, from 1931 to 1937, we were able to establish a *provisional classification of French wheats according to strength*. It being considered in the milling trade that a flour with a W value of 75 makes good bread, and taking into account that the flours obtained from laboratory mills have a W value lower than that of the industrial flours from the same wheats, we have classified the cultivated wheats of France according to the following five grades of strength:

I. – W average above 100, wheats nearly always of the reinforcing type;
II. – W average 90-100, wheats of the reinforcing type in favourable years;
III. – W average 70-90, average wheats adequate in a normal year, needing to be reinforced in an unfavourable year;
IV. – W average 50-70, wheats of low strength, can be added advantageously to reinforcing wheats or true strong wheats;
V. – W average below 50, very inadequate wheats which should be replaced.

The area grown to the five groups of wheat for the years 1932 and 1937 showed the percentages indicated in the following table:

Crop year	Groups					Other types
	I	II	III	IV	V	
1932	5.7	17.8	33.5	25	5.9	12.1
1937	14.3	16.9	32.9	16.1	3.2	16.3

The comparison of these figures, which we will not discuss in detail, indicate an appreciable increase in strength during the period in question, increase which has undoubtedly become more marked since 1937. There is still a large proportion of wheats in which strength has not yet been determined and which are not classified and which should be studied.

It is probable that the propagation of good wheats which have been well tested, will lead, in the near future, to a thorough solution of the problem of the quality of French wheats, considered in the ensemble of the crop. This problem should also be considered from the standpoint of regional distribution of the different classes of wheat, suitable for supplying the local mills, avoiding unnecessary transport.

In applying to the surfaces indicated for each variety by the figures of 1937 the yield of each Department, we obtained a rough estimate of the apportionment of the crop of each Department according to grade of quality. This situation which cannot be reproduced here led to the following conclusions:

The wheats of the first group, still insufficient in quantity, are localized mainly in the regions of the North, East, Centre and West, which assure 93 per cent. of this production, of which 56 per cent. in the North alone.

The wheats of the second group are chiefly produced in the Centre, West and South West.

The wheats, very insufficient, of the fifth group, are limited principally to the South West and the South.

The reason for this distribution is not to be looked for in the climatic conditions more or less favourable to the manifestation of strength expressed by the value of the index W; it lies in the distribution of the wheat breeding stations which have created reinforcing varieties; these naturally were adapted to the regions where they were bred.

There is still much to be done in order to supply Southern France with sufficiently strong wheats, adapted to this region and capable of giving good yields. The production of this half of France represents a quarter of the national production.

Wheat production in France, sufficient as regards quantity, is not balanced each year in the case of strength and necessitates the introduction of North African and foreign strong wheats. This equilibrium is of national importance, as imports are only necessary in years of shortage. Some of the recent varieties obtained by the official stations and private enterprises would enable this problem to be solved promptly if a rational system of comparative experiments decided the farmers on the cultivation range of these new varieties.

The production of reinforcing wheats and true strong wheats in France and North Africa is of European importance, while at the same time it is of primary importance for the utilization of the excess stocks which are expected in the near future. The eventual European buyers demand strong wheats which they purchased from Canada or Argentina; it is indispensable to be in a position to offer them wheats of this type, in large and uniform lots.

IV. — Economic realization of scientific progress

When a new possibility of improvement in the production or utilization of wheat is obtained from laboratory work and field experiments, it is important for the economic realization of these improvements to be realized as soon as pos-

sible, and with the maximum extension, by the rapid diffusion of the varieties and methods recognized as the best; for the purity of the strains to be maintained, by control of the seed production and trade; for the crop to be graded according to its best utilization.

Diffusion of improved Varieties

The popularization of the results of agronomic research is the work of the departmental agricultural Services and the agricultural instruction establishments, which should be kept informed of all new possibilities of improvement. The action on individuals is slow, it can be made more rapid and effectual through the intermediary of cooperative or syndical associations. Conducted visits to comparative experiment fields inspire confidence in the farmers. Finally, when the State is the buyer of the wheat crop, it disposes of means of making its choice of varieties prevail.

The adoption of new varieties should have as counterpart the removal of the supplanted varieties; otherwise the number of varieties increases excessively, causing confusion and making it more difficult for the farmer to choose his variety, as also the classification of the crop. About twelve years ago, there were approximately 700 varieties of wheat in France. The efforts of the official Committee for seed control succeeded in reducing this number to 150. As it is found that for half of the sowings only 7 varieties are employed, there is every right to conclude that 15 to 20 varieties of wheat would suffice to meet all requirements.

The propagation of the results attained with a system of comparative experiment fields would enable the necessary reduction to be made, without arbitrariness and probably without administrative constraint; this would not be the least advantage of these experiments.

Maintenance of the types obtained – Controlled seed production

It is important to maintain in a state of sufficient purity the varieties created and in enough quantity to meet the demand for fresh seed. This aspect of the problem, which comprises the organization of seed production and the control of the crops intended for this production, cannot be neglected without the work of geneticians and the results of comparative experiments being destroyed within a few years. It implies the collaboration of the producers of new varieties and the supervisory organizations of the State.

In Tunisia, for example, all the pure seed (pedigree seed) is produced by approved seed growers and their crops are supervised by officers of the Botanical and Agronomic Service which creates the varieties; two years are enough for one variety to be completely substituted by another; 5 varieties of soft wheat and as many of hard wheat suffice to meet all requirements, even though the rainfall varies from less than 250 mm. to over a metre in the wheat zone.

In France, the registration in the official register of varieties, necessary for the marketing of a new variety, only takes place after a rigid control of identity and botanical purity, carried out on samples of seeds and plants. This test

comprises, for the breeders of new varieties, two very important advantages: the official sanction of the originality of their products and the possibility of taking advantage of the regulations relative to trade-marks as an effective means of protection of the ownership of the new varieties.

To supplement this action of the State in the control of plant varieties methodical experimentation, with systematic comparative experiments, is indispensable in determining cultural aptitudes, cultivation range and baking value of new wheat varieties as, moreover, is carried out in most countries.

The control of commercial seed comes within the province of the Anti-adulteration Board; its object is to standardize the seed trade; this would be all the more simpler and effectual if original seed were purer and better controlled through inspection of the crops.

Full utilization – Preparation for sale

The technical solution of the problem of quality comprises a phase which depends solely on the producers, that of the full utilization of the crop. To neglect it is to lose voluntarily a large part of the advantages obtained from variety improvement.

What is important, to fully utilize the wheat crop, in no matter what country, is to constitute large, homogeneous lots of a definite quality which can be guaranteed and which meet the requirements of the local or importing milling trade. All farm products, and particularly those which undergo industrial manipulation (wheat, brewer's barley, etc.) benefit appreciably in being standardized and made homogeneous, so as to give the buyer the guarantee which enables him to obtain the best utilization of the product.

The cultivation of pure stains of wheat is a veritable biological standardization, constituting the best basis for commercial and industrial standardization; it would be illogical not to utilize every advantage.

In all wheat exporting countries, the crop is divided according to grade each corresponding to the use to which it is to be put. Tunisia and Marocco standardize their strong wheats and guarantee the W value. The silos of La Manouba, Mégrine and Bizerte, which function as port silos in Tunisia, are provided with the necessary installations for the homogeneization of consignments of wheat of the same category. In France, it is the province of the sellers, private individuals and sales cooperatives, to effect the standardization enabling the millers to purchase the wheats they require for their flour mixtures. This grading also makes it possible to set aside the wheats to be withdrawn from human alimentation or to be reserved for seed till spring.

In order to fully utilize the wheat crop in France, it is necessary to:

classify the wheats into several grades according to quality, on arrival at the warehouses;

render uniform the consignments of each category;

determine the strength of these lots before offering them for sale.

In order to reduce to a minimum the expenses for handling, tests and analyses, it is advisable to work with fairly large quantities. The sale in common by

cooperative associations facilitates the full utilization of the crops, which is not possible by small producers individually.

This utilization to the utmost is rendered difficult in France through the subdivision of farm land, the multiplicity and smallness of supplies, the excessive diversity of varieties cultivated, the insufficiency of material means for storage and uniformity. However, it is not irrealizable by simple means, taking into account the two essential factors of strength: nature of the variety (pure strain) and its origin. The full importance of the reduction in number of varieties and the study of the variability of strength according to region by means of regional comparative experiment fields is understood.

It should not be forgotten that it is necessary for the redemption of our national economy to intensify all production, including that of wheat; that the crop of France and of North Africa becomes excessive and that exports are only possible if consisting of homogeneous lots of a definite quality. It would be a great danger for our own economy and a want of comprehension of European solidarity if expedient measures were not taken with a view to the normal utilization of a wheat crop superior to our requirements.

* * *

We have endeavoured to review the different means of increasing and organizing wheat production in the French Empire; we have particularly stressed the technical means of augmenting unit yield, as we consider them more effectual and less arduous, for both private individuals and for the State, than increasing the area cultivated. The French Government, in creating at the Ministry of Agriculture a Scientific Committee of Agricultural Research, has shown that it fully appreciates the importance of improvements in the technique based on science.

To conclude, we readily agree with the opinion expressed by M. AUGÉ-LARIBÉ in his recent book: " There has been a want of a more resolute general superintendence over the French peasant on the part either of the administration or of the professional organizations. His freedom of action has been respected to such an extent, there was such confidence in his judgement, that contact has been limited to giving them information and advice. This explains why agricultural development has been so slow in France.

But it must not be thought that farming has not made very great progress and obtained better results. It has developed more surely than rapidly. This is an attribute rather than a defect. In any case, circumstances have not made a more rapid development necessary and that is certain ".

Conditions have changed; government methods are no longer the same and it is to be hoped that they will be able, better than in the past, to bring into use the resources of our soil and the qualities of our farming peoples, jointly with the producer associations.

CHANGES IN BUTTER DURING STORAGE

Dr Elba Gasser

In the keeping of butter, numerous difficulties are encountered which depend on the nature itself of the raw material. Naturally, it will be easier to obtain a butter with better keeping qualities from milk with which all the requisite hygienic measures have been observed. Even, however when the raw material and the method of manufacture are unexceptionable, the butter is subject to changes. It is from this viewpoint that are studied in the following pages those changes which may occur during the storage of butter, namely, rancidity, tallowiness, fishiness. Seeing that the ensemble of the processes which take place during the deterioration of butter has not yet been elucidated, the endeavour of this article is to give a general idea of the present state of this problem with a view to preventing the aforesaid defects. (*)

Introductory

Owing to the present general shortage of food products, the necessity of placing on the market merchandise as unexceptionable as possible, which does not deteriorate, even when kept over a more or less long period, is more impelling than ever. It is a question primarily of easily perishable produce, with production not uniformly spread over the whole year, but of which, in certain months, there is, so to speak, an overproduction, and, in others, on the contrary, there is a scarcity. In the case of these products, especially butter, more or less long storage is difficult to effect unless all the factors are taken into account.

During the period which follows the manufacture of the butter and its storage, products of mediocre and even of the best quality undergo changes called aging phenomena. Even the best keeping butter, such as that which can be obtained with the present technical methods, in time acquires an ' old taste ', being intermediary between very faint rancidity and a very slight tendency to tallowiness, sometimes greater in the first case, sometimes greater in the second. Frequently, at the same time, there is also fishiness.

I. Rancidity and tallowiness of butter

In general, rancidity is attributed to hydrolytic changes, while tallowiness is produced by the oxidizing processes in the fat, accompanied by undesirable phenomena which affect the odour and taste, but do not cause fishiness.

In butterfat there is an ensemble of fatty acids which can produce, independently of each other, either intense rancidity or else marked tallowiness.

Slight hydrolysis produces rancidity owing to the high content of lower fatty acids, and slight oxidation produces intense tallowiness, characteristic of the autoxidation of oleic acid. In milk fat, therefore, there is the result of each of these two reactions, to a greater degree than can be obtained in other fats by analogous processes.

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* The importance of this problem also stands out from the fact that the ' Deutsche Gesellschaft für Fettforschung ' (German Association for Research on Fats) has opened a prize competition for the study of the change producing fishiness in butter.

A. — Rancidity

The meaning of rancidity is not exactly defined; but generally, it is customary to include under this term the odour and taste of butyric acid (RAHN). What is commonly called rancid butter is the result of the action of two factors on the one hand, the hydrolysis of the butterfat into glycerine and free fatty acid, according to the equation:

$$C_3H_5 \begin{cases} O.CO.R^{I} \\ O.CO.R^{II} \\ O.CO.R^{III} \end{cases} + 3H_2O = C_3H_5 \begin{cases} OH \\ OH \\ OH \end{cases} + \begin{matrix} R^{I}.\ COOH \\ R^{II}.\ COOH \\ R^{III}.\ COOH \end{matrix}$$

$$\text{Fat} + \text{Water} = \text{Glycerine} + \text{Free fatty acids}$$

on the other hand, a β oxidation into ketones of certain fatty acids contained in the butterfat. Among these unpleasant smelling methylketones, there are those of the capröic, caprylic and capric acids. This oxidation is represented by the following equation:

$$R.\ CH_2\ COOH + O_2 = R.\ CO.\ CH_3 + CO_2 + H_2O$$

$$\text{Acid} + \text{Oxygen} = \text{Methylketone} + \text{Carbon dioxide} + \text{Water}$$

The substances which produce rancidity in butter, therefore, are the free fatty acids and a certain number of methylketones. As butterfat has a relatively high content in fatty acids, and primarily in butyric acid, which emits a characteristic strong odour, rancidity is already perceptible on slight hydrolysis. Compared with butterfat, many other fats contain relatively small quantities of the lower fatty acids and relatively large quantities of the higher inodorous fatty acids: palmitic, stearic, etc.

In general hydrolysis is very slow, but a particuler accelerating influence is exerted primarily by special lipolytic enzymes (called 'lipases'), by the hydrogen ions (degree of acidity) and by a high storage temperature.

The lipolytic enzymes (fat-splitting) may already be present in the milk as original lipases or else be produced by certain micro-organisms (yeasts and moulds) and thus cause hydrolysis of the butterfat.

Seeing that, as is known, the rate of enzyme action depends to a large extent on the temperature, the deterioration produced can be successfully controlled, at least in part, by employing a suitable temperature. Thus, for example, by pasteurizing the milk and cream, it is possible to neutralize, up to a certain, point, this harmful influence in the final product.

In certain cases, the acceleration of the hydrolysis process can for the greater part, be attributed to enzyme action. Nevertheless, it should always be remembered that the initial degree of acidity also influences the rate of hydrolysis. In regard to the degree of acidity, it may be said that, the higher it is, the more rapid the rate of hydrolysis. When a butter contains both acidity and lipolytic enzymes, however, hydrolysis is not at all accelerated, as would be expected, but, on the contrary, may be retarded or even checked. (MUNIN), The influence of acidity on hydrolysis is manifested chiefly

in butter made from ripened cream. In fact, ROGERS and GRAY found that, in keeping quality, sweet cream butter was superior to butter made from ripened creams.

To reduce the acid content of a highly acid cream, recourse has frequently been had to the practice of neutralization; it is very dangerous, however, to over-neutralize as this detracts from the keeping quality of the butter. To what extent is hydrolysis promoted during neutralization? This depends on the chemical nature of the neutralizer employed. From the practical standpoint, because of these hydrolytic changes, which may be due to a high degree of acidity, an increase in enzyme activity and to other effects produced during neutralization, a butter made from a highly acid cream should be considered as inferior to sweet cream butter for storage.

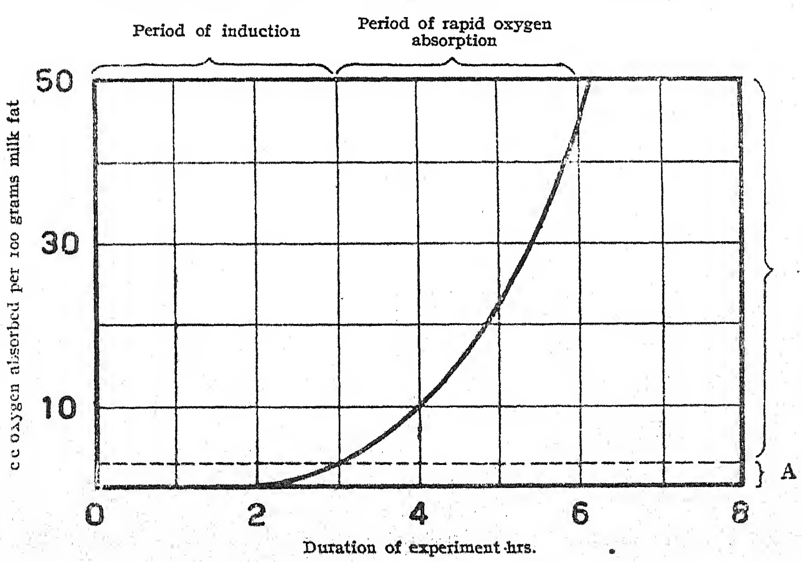
During the storage of butter, the temperature employed has a remarkable influence on hydrolysis, as, according to MUNIN, an increase of 10°C. may double or even triple the rate of reaction.

B. — Tallowiness

I. GENERAL REMARKS

HOLM and GREENBANK have shown that the absorption of small amounts of oxygen by the milk fat or by the oleic acid leads to a tallowy product, and that this defect should be ascribed to the oxidation of double bonds of unsaturated acids.

FIG. 1. — *The nature of oxygen absorption at 95°C. and the changes that occur in the different stages of absorption.*



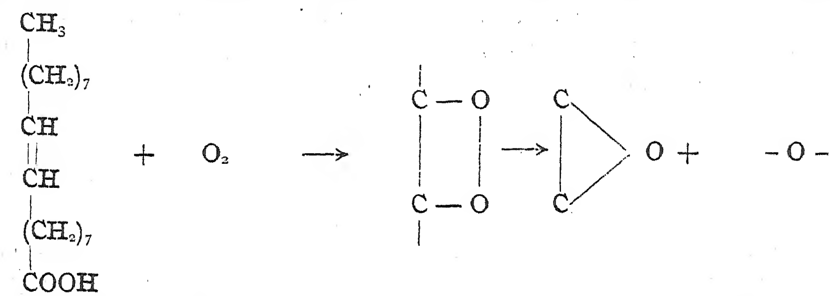
A = Natural colour and flavour
B = Region of tallowiness

According to TSCHIRCH and BARBEN, the butterfat deteriorates proportionately to the quantity of double bonds, and the double bonds of unsaturated acids (particularly oleic acid) which enter into the composition of butterfat only oxidize if this fat is exposed to the action of light, air and water.

Oxygen is not absorbed immediately by the butterfat but passes through an induction period, during which there is very little or no absorption.

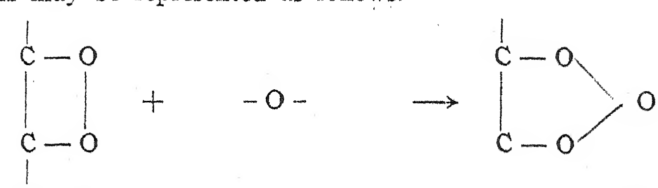
The lower the temperature the longer the period of induction (Fig. 1). As time progresses, the susceptibility of the fat tends to increase.

The reactions which take place during the period of induction are not well understood. There is probably a slight oxygen absorption with the formation of more oxidizable compounds. There would be several reactions occurring simultaneously, the general natures of which may be represented as follows:

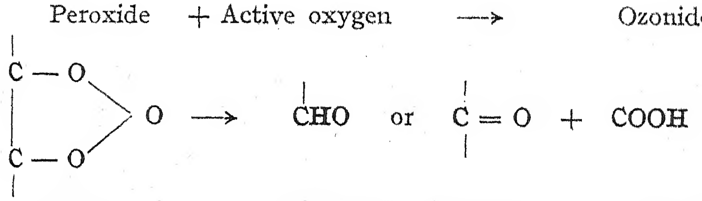


Oleic acid + Oxygen ⟶ Peroxide ⟶ Oxide + active oxygen.

According to TSCHIRCH and BARBEN, the active oxygen, uniting with the peroxide to form a very instable ozonide, which breaks up to form one molecule of an aldehyde or the corresponding ketone and one molecule of an acid. The probable reactions may be represented as follows:



Peroxide + Active oxygen ⟶ Ozonide



Ozonide ⟶ Aldehyde or Ketone + Acid

It is possible that hydrogen atoms necessary to complete some of the reactions comes from other groups in the chain, thereby producing additional unsaturated bonds which are immediately oxidized.

In view of the number of saturated aldehydes and acids isolated by SCALA, oxidation seems to be a progressive formation of unsaturated bonds which are subjected, one after the other to the influence of oxygen. Consequently, as

soon as splitting of the molecules occurs, substances of a catalyzing nature are formed and oxygen absorption becomes rapid, proceeding at a logarithmic rate.

Although the exact nature of the reactions which take place in the different phases is not known, it is found, however, that peroxides are formed progressively, the rate of their formation depending on the temperature, degree of acidity of the product, previous treatment, etc. During the early stages of autoxidation and prior to the stage of active oxidation, the amount of these peroxides present is an indication of the relative facility with which tallowy flavours and odours are produced in a fat during storage.

The formation, in a fat, of peroxides and perhaps other compounds of great oxidizing power makes other reactions possible between the saturated acids present and those newly formed, as, for example, the β oxidations of these compounds in the presence of hydrogen peroxide (DAKIN) and also the oxidations of the γ and δ carbon atoms (RAPEN, CAHEN, HURTLEY). It is evident that a large number of compounds may be present in an oxidized fat.

2. OXIDIZING FACTORS

Different substances catalyze butterfat rendering it tallowy, as takes place, for example, when the oleic acid it contains is oxidized. In this respect, different active factors are: light, heat, air, high acidity, moisture, enzymes, certain metals; they all appreciable shorten the period of induction.

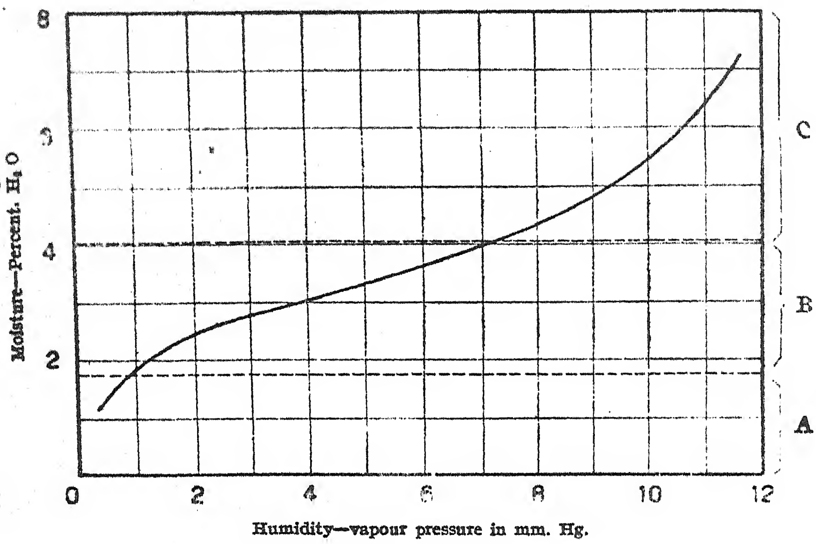
Thus, under the influence of l i g h t , in consequence of an activation of the acidity, the oxidation of the fat is greatly facilitated and, in this respect, the ultraviolet rays as well as certain bands of light of the visible spectrum are particularly active. A similar oxidation can be produced, already in the milk, through the acids dissolved therein. An opposed action, however, may be brought about through the acid requirements of the bacteria contained in the milk. When one of the acids is not neutralized, in a certain sense, by these bacteria, a tallowy flavour may be produced under the influence of light, flavour which, subsequently, can easily be imparted to the butter. This is why, in the storage and transport of butter, the packing must be impermeable to light.

As, in general, h e a t is a factor which accelerates chemical reactions, it has been found, in the case of butter also, that increase in temperate quickens its deterioration.

While, for the most part, there is an agreement between the opinions of the different specialists on the subject of the oxidizing action exercized on butter by light and heat, this does not seem to be the case as regards other factors, in particular, m o i s t u r e. The presence of water or steam appears to retard the autoxidation of fats. Thus the resistance of a butter to oxidation can be increased by thoroughly washing it or passing through steam. A prolonged treatment by steam, however, decreases resistance to autoxidation. The butter must also be dried after this treatment.

In regard to the actual role of water as a catalyzer in the oxidation of the fat in dried milk, HOLM and GREENBANK noted that extremely dry whole milk powder acquires an off odour and flavour quicker than milk powder of higher moisture content. (Fig. 2).

Fig. 2. — *Moisture-vapour pressure equilibrium curve for a dry whole milk*



A = Region conducive to tallowiness
B = Region of optimum moisture conditions
C = Region conducive to fishiness

The slowing up of the oxidation processes caused by moisture is probably due to these two facts: on the one hand, the formation of aldehydes and ketones producing the tallowy odour would be checked; on the other, in a humid atmosphere, the formation of acids of no tallowy odour would be promoted. But, since acids act as catalysts in the oxidation process, after a preliminary stage (induction period), the rate of oxidation should be rapid, which, moreover, was found to be the case of milk powder having a relatively high moisture content. That is why, according to Rogers, the moisture content of a milk powder is a critical factor in determining the rate of oxidation in this product.

The role of water in butter is all the more important in that the majority of the factors producing chemical deterioration of butter appear on the fat-water interface. In this way the following substances are found: lactic acid of the curd and oleic acid of the fat — lecithin dissolved by the lactic acid and solution of sodium chloride — traces of heavy metals — oxygen dissolved jointly with peroxides of fat and then with traces of hydrogen peroxide (Davies).

In the splitting of butterfat, the water serves as a solvent for the free acids and as a medium for the hydrolysis reactions (oleic acid in brine droplets). According to King, the fat-water interface the is part where decompositions are most easily produced. If the susceptibility of the products to oxidation is to be diminished, any method of neutralization promoting hydrolysis in any form whatsoever must be avoided.

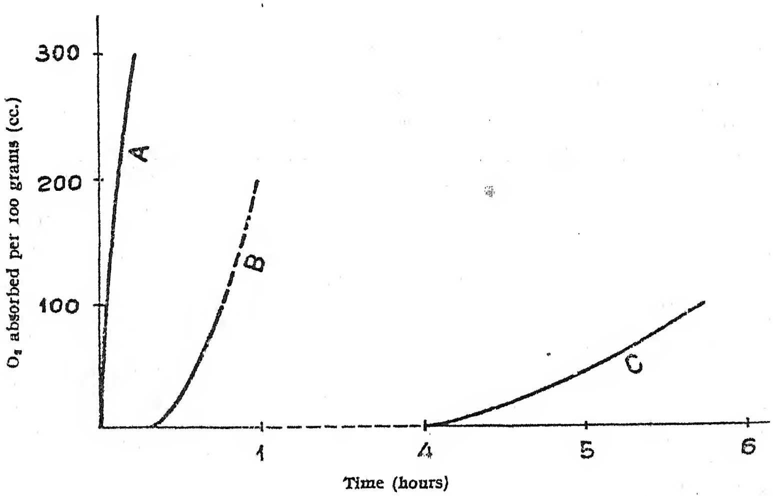
Besides these different factors, however, a relatively high percentage of air (4 to 6 per cent.) may also produce oxidation of butterfat.

ROGERS and his co-workers have studied exhaustively the influence of acidity on the storage of butter. As a general conclusion, they were able to establish that this factor is decisive, as an increase in acidity of a fat renders it more susceptible to oxidation. It is for this reason that sweet cream butter always keeps better than butter made from ripened cream.

Moreover, it has been possible to prove that fatty acids act as catalysts in this oxidation, where those with a higher molecular weight appear the most active. Oleic acid owes its high catalyzing power not only to its acid properties, but also to the easy oxidation of its double bond and to the catalyzing action of the secondary products which are formed during oxidation.

In Fig. 3 comparison is made of the respective rates of oxidation of: oleic acid, $C_{18}H_{34}O_2$, which has one double bond — linoleic acid, $C_{18}H_{32}O_2$ which has 2 — ricinoleic acid, $C_{18}H_{34}O_3$, which has 1 double bond and 1 hydroxyl group. It is the linoleic acid which becomes oxidized the most rapidly and the ricinoleic acid the slowest, fact due to the hydroxyl group.

FIG. 3. — *Rate of oxygen absorption by various unsaturated fatty acids*



A = Linoleic acid
B = Oleic acid
C = Ricinoleic acid

KING showed that diacetyl (aroma of butter) also plays a role as transmittor of acidity; it can easily be reduced into acetone and into 2 to 3 butylene glycols.

In regard to the enzyme action in the oxidation of oleic acid, according to KENDE, it is exercized chiefly by the enzyme designated oleinate.

The action of salt presents conditions similar to those which govern the action of the degree of moisture. Salt exercizes a favourable or unfavourable

action on the keeping quality of butter, according to the amount and the environment. MUNIN considers that the exact quantity should be calculated by means of special formulae.

WILEY determined the rate of oxidation (quantity of aldehyde) of salted and non-salted butter with pH=5. In sweet cream butter, salted and fresh, no oxidation was ascertained even after 4 months. With acidified salted butters, the highest oxidation was noted in butter obtained with the use of acid cultures, the lowest in that made from cream acidified with lactic acid. The poorest result was salted butter prepared with the use of acid cultures.

It is known that certain metals are active accelerators in many reactions in organic chemistry, for instance the use of finely divided nickel in the hydrogenation of oils. Copper especially, because of the ease with which it passes from one state to another and acts as a transmittor of acidity has long been known as an excellent catalyst. Other metals possessing marked catalytic oxidizing activity are the following: iron, vanadium, platinum, silver, nickel, cobalt, cerium, chromium, uranium and lead.

It follows that, if the milk products have even a very low content in metals (particularly copper and iron), oxidation and consequent tallowiness are produced. It is observed in fact that traces of copper and iron may cause a rapid deterioration of the butter.

Copper salts, in the proportion of 10-15 parts per million parts of milk solids, produce tallowiness in milk powder (ROGERS). This shows the danger of the use of copper in the handling, transport of and trade in milk and its products.

From the results of his investigations, BARNICOAT explains the influence of traces of metals as follows: the pellicles of the globules of fat are formed by a lecithin-protein compound and absorb small quantities of metallic ions. In the presence of the dissolved acid, these cause, by catalysis, the oxidation of the aforesaid compound. This process, therefore, exerts an oxidizing action on the fat contained in the pellicle of the globule. If oxidation of the lecithin-protein compound has begun in the fat of the cream, it continues to take place in that of the butter.

DAVIES also recognizes that the traces of heavy metals contained in the cream are absorbed as proteinates by the fat-water interface. That is why they appear in a more concentrated form in the butter than in the cream.

The relation between tallowy flavour and bleaching of the carotene is important. A flavour or odour characterizing tallowiness appear in butter long before the loss of colour, and the butter is already in a state of advanced oxidation when a notable discoloration is evident. If oxidation of the butter continues, darkening of the surface subsequently occurs.

3. ANTI-OXIDIZING FACTORS

From the preceding it follows that, to prevent the deterioration of milk fat by oxidation, it is necessary first of all to retard the early processes, namely, maintain as long as possible the induction period.

Naturally, the lower the temperature the longer the induction period. The length of this period, therefore, provides a good means of estimating the keeping quality of butter.

In a fat suitable for storage, the induction period is so long that, at a low storage temperature, it continues, so to speak, indefinitely. On the other hand, in butterfat, it is achieved fairly easily and, when it ends, this fat can absorb oxygen even at a low temperature.

HOLM, WRIGHT, GREENBANK have studied the reactions regarding the tendency of the fat in milk powder to oxidation during storage at various temperatures above 0°C. They have noted that near 0°, this fat keeps much better than at 10° and that its keeping quality deteriorated fairly rapidly when the temperature rose to 20°.

According to GRAY, MACKAY, ROGERS, THOMPSON, KEITHLEY, etc., for the more or less prolonged storage of butter, the temperature should be maintained at about –18°C. This conclusion agrees with the results of the investigations of ROGERS and his co-workers regarding the influence of different temperatures on the formation of peroxides in pure fats. At temperatures below –10°C., there is little or no increase over long periods of storage; however the rate augments with increases in temperature. MOHR states that the optimum temperature for long storage of butter lies between –10° and –15°C.

Among the other anti-oxidizing factors, the action of clarification is particularly worth noting. Thus, in clarifying milk by removal of the slime before transforming it into powder, a product which will keep much better is obtained. This fact has been confirmed in an inverse way by adding after finishing, this slime to the clarified milk: this caused the keeping quality of the product to diminish. Clarification also increases the keeping quality of dried cream.

Other experiments, carried out by SCHULZ and STORCK, regard the clarification of butter oil, which, as regards keeping quality, is best effected by centrifugation without the adduction of water. In fact, centrifugation carried out with the use of water reduces this quality because, according to the aforesaid authors, the water eliminates the anti-oxidants.

In order to increase the keeping quality of butter and other milk products, considerable study has been given to the adoption of a suitable 'neutral' medium, composed mainly of inactive or inert gases, primarily carbon dioxide. The investigations of HOLM, WRIGHT, GREENBANK, however, indicate that, as regards milk products, CO_2 cannot be considered as an inactive gas. On the other hand, storage in nitrogen or in vacuum reduces slightly the tendency to deterioration but should not be considered an absolute safeguard to prevent oxidation changes.

With the study of MOUREAU and DUFRAISSE on the repressive influence of hydroquinol on the oxidation of acrolein and benzaldehyde, the question of anti-oxidants began to receive serious consideration. The investigations of these workers showed that substances having a phenyl group protect, against the influence of oxygen, a certain number of compounds subject to autoxidation, and that also other substances not having the character of phenol act, under certain conditions, as anti-oxidants. In general, the substances studied comprise natu-

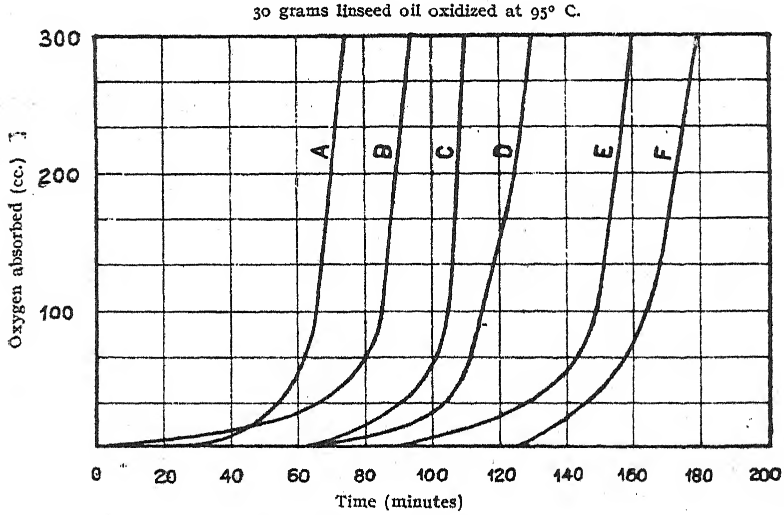
ral pigments, phenols and other compounds of the aromatic series as well as acids of the fatty series,

The natural pigments (carotenes) are found chiefly in certain vegetable oils, but also in butter. Opinion differs as regards their action. Thus, for example, according to HOLM and GREENBANK, quercetin possesses anti-oxidizing properties, while lycopen and carotene, on the other hand, would accelerate the oxidation of glycerides. On the contrary, MUNIN makes special mention as anti-oxidant, among the colouring substances of butterfat, of unsaturated carotene. Hydroquinol, pyrocatechol and pyrogallol have a stronger anti-oxidant power than phenol and resorcin. In this respect, it was seen that 1.2 and 1.4 dihydric phenols protect the fat against oxidation, probably because the 1.2 and 1.4 compounds are capable of forming quinones and thus give rise to reduction-oxidation systems. It was also observed that most of all the position of the double bond in regard to the hydroxyl group is important from the standpoint of anti-oxidizing capacity. In general, the position of the hydroxyl itself is important, as is proved by the fact that maleic acid manifests an anti-oxidant effect, while its isomer, fumaric acid, has none at all.

Fig. 4 illustrates the influence of the addition of such substances to linseed oil as anti-oxidizing factors.

FIG. 4. — *Effect of anticatalysts upon autoxidation of linseed oil*

30 grams linseed oil oxidized at 95° C.



A = Linseed oil
B = » + Dihydroxy stearic .1 g.
C = » + Glycerine .1 g.
D = » + Resorcinol .1 g.
E = » + Phenol .1 g.
F = » + Benzylic alcohol .1 g.

The present tendency is to attribute the remarkable keeping quality of vegetable oils to natural antioxidants present in the raw material, but which are eliminated or destroyed in refining. Moreover, it has been found that pure but-

terfat is oxidized more rapidly than butter as that, according to RITTER and NUSSBAUMER, the anti-oxidizing agents must be in the milk serum.

In butter, among the principal anti-oxidizing substances, there seem to be phospholipids of the serum; this has been confirmed, in comparative experiments, by the addition of lecithins obtained respectively from milk, butter and eggs. BARNICOAT and PALMER attribute the greatest importance to the content of the serum in soluble phosphates and citrates. In churning an artificial cream to which these salts have been added, it was found that the salts in question exercized a remarkable protective action; this finding, moreover, is in agreement with the results of investigations regarding other fats.

When melting poor quality butter, using receptacles and apparatus not entirely irreprochable, it is advisable, according to SCHULZ and STORCK, to add to the product, before clarifying, 0.5 per cent. oatmeal. On the other hand, oatmeal extract is used to impregnate wrappers.

Particular stress should be made of the anti-oxidant action of wheat sprout oil. In his studies on the respective oxidation of different fats, MATTILL found that the outset of oxidation may be checked or retarded by the addition of fresh wheat sprout oil *; no discoloration of the butter takes place or, if so, only very slowly.

MUNIN explains this retardment of oxidation in butter as being the addition of hydroxyl groups to other fats which do not possess them; he points out, however, that the property of retarding or preventing rancidity is lost if the hydroxyl groups are acetylated, namely, if CH_3COH becomes CH_3CO.

It has been ascertained that this anti-oxidant action is connected with the unsaponifiable part of wheat sprout oil. This property is also possessed by chemically pure compounds found in this oil (*e. g.*, tokopherol compounds) and which can be obtained by synthesis. There are also other vegetable fats which contain the same compounds, although to a lesser extent.

In regard to the action of anti-oxidants, it should be noted that it diminishes in time, so that oxidation may not only take place but even, according to conditions, be accelerated.

In reviewing the different studies on anti-oxidants we were surprised to find, as far as we know, that experiments based on the addition of lactose and products such as calcium lactate, have not been taken into consideration for butter. The addition of these products would prevent any introduction of extraneous substances in the milk. Since various workers, as regards the problem of storage of butter, stress the importance of beginning with fresh sweet cream, this signifies that lactose is concerned either directly or indirectly. Moreover the reducing power of lactose is sufficiently known. The addition of calcium lactate would serve for the linkage of the free acids.

The advantage of the addition of the aforesaid substances is that they come into the normal composition of butter.

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* It should be noted that the action of anti-oxidants is greater when the product treated is fresh. In a general way, ROGERS recommends, in order to obtain a good keeping butter, using cream as fresh as possible.

II. — Production of Fishiness in butter

A. — The phosphatides in milk

I. General

The phosphatides or phospholipids are among the substances most widely distributed, but the least known.

They are found in most organic substances, but particularly in those where vitality is being generated: eggs of all kinds, shoots or sprouts; they also occur in small quantities in milk and milk products. Moreover the brain is an abundant source of phosphatides, in particular cephalins.

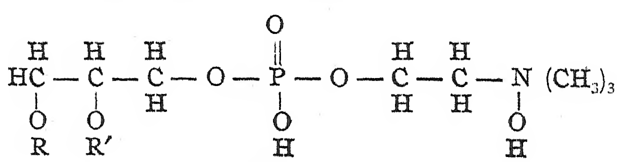
The phospholids comprise all substances which contain phosphorus in the state of organic compound, which are of a fatty nature, and consequently saponifiable, and which dissolve in most organic solvents (ether, petroleum ether, benzine, etc.), but not in acetone or ethyl acetate.

These phosphatides with water form colloidal solutions from which they can be precipitated by acetone, more easily in the presence of salts.

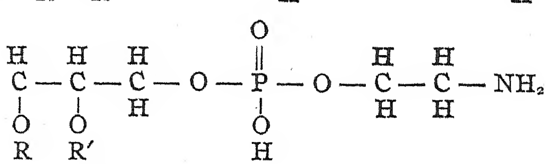
The phosphatides are divided into groups, the chief of which, lecithins, cephalins and sphingomyelins, are found in milk and butter. The lecithins and cephalins are hydroscopic and readily oxidize when exposed to air, contrary to the sphingomyelins, less subject to oxidation.

The lecithins are completely soluble in alcohol and contain cholin. On the other hand, the cephalins are practically insoluble in alcohol and contain cholamin.

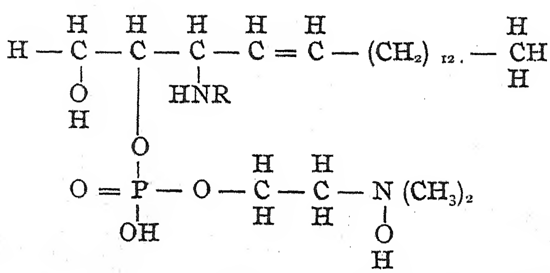
According to Savini, Rogers, the three phosphatides contained in butter have the following chemical structure:



Lecithins



Cephalins



Sphingomyelins

(R and R′ represent fatty acid radicals)

OSBORNE and WAKEMAN found that milk contains small quantities of mixed phospholipids, a monoamino and presumably a diamino phospholipid; in the former, they recognized the presence of oleic and stearic acids. On the other hand, SASAKI and HIRATSUKA concluded from their investigations that the lecithin of milk contains myristic and lauric acids.

According to ROGERS, the analysis of the cephalin-lecithin part gave the following percentages of fatty acids:

Myristic	acid	5.23	per cent.
Stearic	»	16.06	» »
Arachidic	»	1.85	» »
Oleic	»	70.58	» »
Dicostetrenoic	» ? (acid with 22 carbon atoms and 4 double bonds)	6.28	» »

Phosphatides are always present, in more or less appreciable quantities, in milk and in milk products.

The proportions of these substances in milk and in milk products given up to date show great variation, which should be ascribed primarily to the analytical methods employed and, to a lesser extent, to the natural differences in the proportion of phosphatides. Table I gives some idea of the differences found.

TABLE I. — *Minimum and maximum proportions of phosphatides found in different milks and milk products.*

Skimmed milk	0.0015 — 0.1500	per cent.
Whole milk	0.0038 — 0.2889	» »
Pasteurized milk	0.1388 — 0.1692	» »
Cream	0.0500 — 0.3340	» »
Butter	0.0140 — 1.6000	» »
Butterfat	0.0000 — 1.7300	» »
Buttermilk	0.0332 — 0.8768	» »

According to MOHR and MOOS, the proportion of lecithin increases with the proportion of fat in the following order: skimmed milk—whole milk— cream. In churning, most of the lecithin passes into the buttermilk; in this respect, there

TABLE II. — *Minimum and maximum proportion of lecithin found in butter by different workers (according to* MOHR *and* MOOS).

	Lecithin percentage	
CUSICK	0.0433 — 0.0723	per cent.
BRODICK-PITTARD	0.1500	» »
REWALD	0.95 — 1.6	» »
BENEDIKT-ULZER	0.017 — 0.38	» »
SCHMIDT-MÜLHEIM	0.153 — 0.1736	» »
BEILSTEIN	0.15 — 0.17	» »
LEWKOWITCH	0.017 — 0.17	» »
SUPPLEE { Butter from sweet cream	0.0723	» »
SUPPLEE { Butter from pasteurized cream	0.0433	» »
KÖNIG-SCHREIBER	0.0819	» »
JÄCKLE	0.0035 — 0.0136	» »
LIESEGANG	0.5 — 1.2	» »

are differences between sweet cream churned immediately, on the one hand, and, on the other, preserved sweet cream or ripened cream, in this sense that the latter two cede less lecithin to the buttermilk. RITTER considers that there are also differences, as regards lecithin content, between melted and cooked butter.

The lecithin content of butter, determined by different investigators, varies considerably, as can be seen from Table II.

2. IN WHAT FORM ARE PHOSPHATIDES FOUND IN MILK?

Are phosphatides found in the milk serum as such, in the free state or, on the contrary, associated in some way with the fat, lactose or proteins?

Should the sterins and vitamins also be taken into consideration?

Can the phosphatides be absorbed by the fat globules and form part of their pellicle?

Such are the questions which now have to be confronted.

According to BLEYER, the greater part of the phosphatides would be 'dissolved' in the fat and the remainder would be distended in the plasma of the milk and probably bound by adsorption to the proteinic substances, distribution conforming to the ratio fat: plasma. Since most of the lecithin is 'dissolved' in the milk fat, it should, considers this worker, pass into the cream.

With a view to ascertaining whether the phosphatides can be adsorbed (together with other constituents) at the surface of the globules of fat, namely, at their limit with the serum, MOHR and MOOS employed a physical method based on surface tension. They thus proved that the phospholipid may be linked by adsorption to the surface of the globules of fat. As to whether this tendency to reunion extends as far as solution, however, is still an open question.

OSBORNE and WAKEMAN state that there is lecithin in both skim milk and in the precipitated casein and albumin.

The opinion of MOHR and MOOS, according to which the phosphatides may be adsorbed by the proteinic substances, is fully confirmed by the investigations of PARSONS showing that the adsorptive bond of the lecithin with the casein depends on the relation between the components of the mixture and the degree of acidity of the solution.

According to MOHR and MOOS, the phosphatides of milk are partly linked by adsorption to the protein; but, however, it must also be supposed that they are linked with the fat; this fat only contains traces of dissolved phosphatides.

Phosphatides do not pass quantitatively into the cream. Pasteurization affects them to some extent. On churning, those which were adsorbed by the fat separate out and accumulate in the buttermilk.

Particular note should be taken of the behaviour of lecithin in melted butter, clearly distinguishing between melted butter (below 50° C.) and cooked butter (above 100°C.), as, in the first case, the lecithin does not pass into the melted fat, while in the second case, RITTER considers that it does so. If this cooked butter containing the lecithin is filtered while still hot, the lecithin also passes through into the filtrate.

The phosphatides, therefore, depend on the fat to an extent which varies according to environmental conditions, as, for example, a more or less high temperature.

In regard to other possible states of phosphatides in milk products, MOHR and MOOS consider it probable that, under certain reaction conditions, small portions of these substances are found *freely distributed in the milk serum in the colloidal state.*

Are lactose, the sterins or even the vitamins associated in some way with the phosphatides? In solving this question, account could be taken of the observations made by REWALD on plant phosphatides and eventually applying the results to milk phosphatides.

3. DECOMPOSITION PRODUCTS OF PHOSPHATIDES.

Among these products is the substance which communicates a fishy odour to butter. The hydrolytic decomposition of phosphatides is represented by MOHR and MOOS as follows.

(1) Lecithin (or cephalin) + H_2O ⟶ fatty acids + cholin (or cholamin) + glycerophosphoric acid.

(2) Glycerophosphoric acid ⟶ glycerine + orthophosphoric acid.

(3) Cholin ⟶ trimethylamine + ethyleneglycol.

According to DAVIES, fishiness is due to the presence of tertiary nitrogen. The cholin contained in the butter is, therefore, the most probable source.

Cholin is a solid substance, very soluble in water and easily fixing the carbon dioxide of the air, which seems to be an excellent nutrient medium for fungi (CZAPEK). Under the action of certain bacteria, the cholin may produce trimethylamine, monomethylamine and also other very poisonous substances.

At ordinary temperature, *trimethylamine* is a gas which easily dissolves in water. Its odour is even perceptible in the proportion of a millionth part of a gram. SOMMERFELD, SUPPLEE and CUSICK consider that when butter has a fishy odour, the presence of trimethylamine and the simultaneous decrease in the proportion of lipoid phosphorus can be detected, as MOHR and MOOS have confirmed from control experiments.

According to DAVIES, the decomposition of cholin into trimethylamine or its oxide may only take place through oxidation by hydrolysis. The tertiary nitrogen may form organic compounds with the butterfat or with the oxidation product and, in this case, the proportion of nitrogen advances on a par with the development of fishiness. When this has started the amino nitrogen may be methylized and contribute further towards increasing it. The product which has this odour is volatile and is firmly retained by fats. Its formula, however, is unknown. It is probable that the physical structure of butters and primarily the fat-water interface play an important role in the development of fishy odour, as it cannot be produced in butter in the pure state.

The decomposition of cephalins generates *cholamin* (amino ethyl alcohol), a caustic product, with a strong basic reaction.

4. Factors regarding the decomposition of phosphatides

Among the factors producing a decomposition of phosphatides and fishiness, mention should be made of: degree of acidity – water content – salt content – lipolytic moulds – traces of heavy metals, etc. Frequently one of these factors may influence another.

Rogers and Gray found that the addition of acids increased the tendency of butter to contract a fishy odour. Since low acidification promotes the hydrolysis of lecithin, it follows that acids contribute to this defect.

According to Davies, the influence of a strong acidity of the cream on the appearance of fishy odour is in relation to the slow liberation of organic acids in the butterfat, that is, primarily to that of oleic acid.

This fact may be observed chiefly in butters stored for some time, with a high titrable acidity, in old butter, and in those that contain moulds (*Oidium*, for example), where oleic acid represents 60-70 per cent. of the free organic acidity. The release of oleic acid liberates a certain quantity of active oxygen, and fishiness appears when the proportion of oxygen in the hydrogen peroxide has attained a certain degree (corresponding to 15-20 mg. of 0.002 N thiosulphate per gram of butterfat). The high titrable acidity of a butter containing an *Oidium* may be attributed in part to the free oleic acid. A higher concentration of this acid at the fat-water interface of the butter accelerates oxidation and thus hastens the appearance of fishiness.

The fact that this defect is found in all milk powders with a high water content (including dried milk containing too much water) shows that this factor is of some importance. Moreover, Rogers states that he has never encountered fishiness in unsalted butters, and other investigators observe that it is a defect mainly of salted butters. Since lecithin dissolves more easily in a salt solution than in water, Sommer holds that, probably during the working of butter and especially in cases of overworking, the lecithin is concentrated in the salt solution, wherein water and acidity would have their maximum effect. This is probably true in the case of renovated butter. According to Rogers, the part played by oxidation in this reaction would be indirect and slight, although it may constitute a concomitant phenomenon.

In his investigations, Davies started from the fact that a full flavour butter, made from highly ripened cream, frequently liberates a fishy odour. He found that the decomposition of the cholin could only be effected through oxidation, in which traces of heavy metals act as catalysists. When the serum of the milk was weakly acid (pH=6.8), fishiness appeared, at room temperature, 60 hours after the addition of the millionth part of a gram of copper (in the form of lactate) and 48 hours after adding two millionth parts of this metal. With iron, manganese, nickel, chromium and silver, fishiness could be produced after 5 days with the addition of five millionth parts of these metals.

The lipolytic moulds capable of givin rise to fishiness appear primarily to be those which can split esters into free fatty acids (especially oleic acid) and glycerine, as, for example, the *Oidium* already mentioned.

In his investigations, DAVIES observed a marked preference of these moulds for splitting esters containing oleic acid. The liberation of this acid immediately produced oxidation with consequent fishiness.

Also various workers have remarked that the type of feed given to the cow would have some influence on the appearance of fishiness.

5. FACTORS OPPOSING THE DECOMPOSITION OF PHOSPHATIDES

As the appearance of fishiness is generally connected with the presence of nitrogenous substances capable of producing trimethylamine, in the first place lecithin, then betaïne, eventually hypaphorin and carnithin, and also the oxide of trimethylamine studied by DAVIES, first of all, the factors which promote the evolution of trimethylamine must be eliminated.

Thus, to prevent stored butter acquiring a fishy odour, ROGERS and his associates advocate *not acidifying* pasteurized cream and also starting out with a cream as fresh as possible.

In this respect, the pasteurization of the cream seems to be particularly important, as it reduces the tendency of butter to acquire fishiness, as different investigators have observed: PLATON, RITTER, MUNIN, etc. Investigations and research have shown the importance which should be ascribed to the temperature attained during this operation. Thus HUNZIKER on the one hand, and MOHR and EICHSTÄDT on the other, recommend going beyond 90° C. if possible, and RITTER advises pasteurizing between 88° and 90°. According to the latter, different experiments carried out in Switzerland indicate that the pasteurization temperature is highly important as regards the keeping quality of butter made from ripened cream.

RITTER considers it probable that, at a high temperature, small quantities of anti-oxidizing substances, which have not yet been studied, are formed.

KENDE also supports the opinion that at high pasteurization temperatures substances are formed which can exercize on the process of oxidation of the milk an action which is produced in a sense contrary to that of copper.

The favourable action of double pasteurization, stressed by PLATON, finds application in the manufacture of butter as carried out in Denmark: first the milk before separating and subsequently the cream obtained are both pasteurized.

Since the addition of anti-oxidants makes it possible if not to prevent entirely the appearance of fishiness, at least to retard it for some considerable time, the use of hydroquinone, methol, etc. has been considered.

B. — Phosphatides originating in products other than milk, particularly soybean

I. GENERAL

To solve the problem of the part played by phosphatides in milk, a comparison with other phosphatides in the animal and {plant kingdoms is not without importance. Thus, for example, in the *animal kingdom*, the brain and egg yolk are the chief sources of phosphatide: the brain is composed mainly of

cephalin, while egg yolk contains almost exclusively lecithin. According to the method of preparation, the lecithin obtained from egg yolk shows variations in behaviour. Starting with dried egg yolk, containing about 10 per cent. lecithin, with the method described by REWALD, a product having the consistency of honey and a nutty taste and which still comprises some impurities, is obtained. In order to obtain a purer product, fresh egg yolk is employed.

According to REWALD, however, these absolutely pure products have a serious disadvantage: they rapidly deteriorate acquiring a dark colour (from brown to almost black), as well as an unpleasant odour and flavour. Production takes place, though to a much greater degree, of the phenomena of rancidity and oxidation as is observed in fats and oils after storage over a more or less long period. Sometimes resinification also occurs and, through exposal to air, moisture absorption as these lecithins are very hydroscopic.

Particular importance should be ascribed to the behaviour of some phosphatides in the plant kingdom. Among the plant products containing phosphatides, mention may be made of soybeans, wheat sprouts, rapeseed, etc.

At present, soybeans probably constitute the chief raw material for the preparation of phosphatides, which are supplied by the mucilaginous matter obtained on extracting soybean oil by means of organic solvents.

After having been dried in a forced vacuum and freed of the small quantities of water they still retained, these phosphtides form a doughy paste, yellow to brownish in colour, They constitute an intermediary matter between the lecithins of egg yolk and the cephalins of the brain, or better, a mixture of the two substances, in which the cephalin compound generally predominates. Nevertheless, the product obtained is not hard and dry, but soft, like that produced from egg yolk.

2. IN WHAT FORM ARE PHOSPHATIDES FOUND IN SOYBEANS ?

Soybeans are particularly rich in phosphatides, containing up to 2 per cent. With ordinary extraction, only the 'free' phosphatides, amounting to about 25 per cent., are obtained; the remainder, namely the phosphatides linked to the protein or linked physically to another substance, are not extracted with ordinary solvents. These soy phosphatides, generally called lecithins, although properly speaking they do not consist of pure lecithin, possess properties which make them particularly suitable for technical use. They remain unchanged practically indefinitely; this is explained by REWALD as follows: a closer study shows that it is a question of a mixture of phosphatide and oil which nearly always has the same composition: 60-65 per cent. phosphatide and 30-35 per cent. oil; it is with this more or less constant composition that it separates out from the oil properly so called.

This specific behaviour has special very important advantages for technical use. The usual changes do not occur: there is no rancidity, nor increase in acidity, nor changes of any sort, even if stored exposed to air for some weeks. REWALD considers that between the phosphatide and the oil there must be reciprocal influences which produce this advantageous result.

Moreover, REWALD calls attention to another observation: it is generally acknowledged that these plant products contain only phosphatide and oil; in reality, however, their composition is more complicated. In fact, recent research work has indicated that some not inconsiderable amounts of carbohydrates (sugars) are always found.

While, normally, polysaccharides are completely insoluble in organic solvents such as benzine and ether, they dissolve relatively well in the presence of sufficient quantities of phosphatides.

The quantities of sugars present vary between 2 and 10 per cent., according to REWALD, they always occur, but it is difficult to isolate them in the pure state, because they are associated with the phosphatides.

Besides the oil and the sugars, another group of substances: the sterins are constantly found with the phosphatides; those of soybeans always contain phytosterol (stigmasterin).

REWALD does not say if, in the behaviour of soybean phosphatides, vitamins also play an anti-oxidizing role. The anti-oxidant action of vitamin C in milk is known; however, can the cooperation of a vitamin also be acknowledged in the case studied here? This question remains open.

Owing to their special constitution and specific behaviour, plant phosphatides find a use, in very small quantities, in different industries. The colloidal properties of these phosphatides and their solubility in fats are especially turned to account in margarine manufacture. The addition of 0.1 to 2 per cent. phosphatide suffices to obtain browning on cooking and prevent spurting in frying.

To date, no explanation has been given of the role of phosphatides in chocolate-making, in which very small quantities of lecithin (0.2 to 0.3 per cent.) are also employed. In this way the normal addition of cacao butter or other solid fat can be appreciably reduced as the small quantities of phosphatides added render the chocolate mass easier to melt and augment the keeping quality of the product. However, a surprising thing is that, if over 0.5 per cent. phosphatides are added, their effect is not increased, contrary to what would be expected, and, above 1 per cent., these substances even act in the inverse sense.

3. DECOMPOSITION OF THESE PHOSPHATIDES

In regard to the easy oxidation of phosphatides, as well as their decomposition products which generate fishiness in butter and margarine, REWALD found that in an aqueous solution, phosphatides withstand to a remarkable degree oxidants as strong as hydrogen peroxide. On the other hand, the presence of strong organic acids, as, for example, lactic acid, does not in any way destroy phosphatides, and the cooperation of the two factors, oxidation and acidity, does not produce any fishy odour even after several months.

It is not easy to decompose phosphatides in this way. While as to ascertaining how decomposition is produced in the presence of catalysts and small quantities of copper or other metals—to what extent the concentrations of acids and phosphatides play a part—the degree of influence of the environment—these are all questions which still remain to be solved.

Conclusions

It is seen from this study that, in view of its peculiar composition, butter deteriorates much more rapidly and completely than other fats.

In a general way, it may be said that all changes which take place in butter are due either to hydrolysis or to oxidation. Those which cause rancidity and tallowiness lie in the butterfat itself, while fishiness should be ascribed to the substances which accompany this fat.

R a n c i d i t y is due chiefly to the hydrolysis of the fat and the oxidation of certain lower fatty acids with the formation of ketones. Since the degree of acidity (pH), certain enzymes and temperature particularly influence hydrolysis, taking into account these factors, the storage of butter can be extended appreciably without rancidity occurring.

The change in butter which causes t a l l o w i n e s s is due to the oxidation of certain unsaturated fatty acids, in particular, oleic acid. This defect can in fact be controlled by prolonging the 'induction period' to the maximum and by taking into consideration the influence of light, air, temperature, humidity, degree of acidity, proportion of salt, the presence of metals which always act as catalysts. The use of anti-oxidants is considered as a means of extending this induction period.

In regard to the appearance of f i s h i n e s s, most investigators seem to acknowledge that it is caused by the decomposition of phosphatides. These latter are probably present in butter in different forms, one of which produces the change which leads to fishiness, while another not only does not produce this change, but even prevents it. On the other hand, this behaviour of phosphatides also appears to depend on the medium in which they occur, the H-ion concentration, the presence of catalysts, etc.

As regards the influence exercized by type of phosphatide, it should be noted that, among the three groups mentioned: lecithin, cephalin, sphingomyelin, it is lecithin which is most easily changed and which is found in the largest amount in butter, while in soybean oil, cephalin, which is more stable, predominates. In comparing the behaviour of the phosphatides of butter with those of vegetable oils (especially soybean oil), further possibilities of research which will probably enable this problem to be definitely elucidated may be foreseen.

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BOOK NOTICES *

BONVICINI, Mario: *Miglioramento genetico delle piante agrarie*, Torino, Unione tipografico-editrice torinese, 1942, 306 pp., 172 illustrations and 8 diagrams. Price: 60 Lire.

In view of the important results obtained in plant improvement in Italy, the want of a popular work in Italian on this subject must have been felt as a lacuna in agricultural literature. Now, from the school of Prof. TODARO at Bologna, has emerged

* Reviews of books presented to the Library are given under this heading.

a research worker who has undertaken to explain to a wider circle of readers the fundamental principles and execution of the genetic improvement of agricultural plants, as the title of his book indicates.

The first part gives, in a clear and concise manner, the elements of genetics according to the most recent knowledge on the subject, as a starting-off point and ground-work for the explanation of the principles of practical plant improvement which is dealt with in the second part.

The third part of the book which is the largest, describes the execution of the methods employed for the improvement of the chief crop plants and, in particular, those which the author knows thoroughly owing to his own work as a plant breeder, as he devotes all his attention to the species, and varieties in which he has specialized. Particularly instructive and valuable is the part on wheat improvement, especially as regards the chapter on testing for quality, in which the data relative to gluten determination and panification tests merit close attention. The new methods for determining baking quality and the apparatures which have come to the front are evaluated according to their merit; excellent illustrations are given on the subject in question. Special mention should also be made of the chapter on rice improvement, which accords the importance it deserves to a subject long neglected in Europe. The increasing interest in Italy in the production of seed potatoes is manifested in the informative chapter on potato improvement. Details are also given on the improvement of hemp and of forage legumes, in particular, lucern.

Mention should also be made of the excellent printing and general get-up of this work and the very numerous illustrations.

N. G.

FRÖDIN, John: *Zentraleuropas Alpwirtschaft.* Bd. I. u. II, Oslo, H. Aschelong (W, Nygaard), 1940 (Oslo, Instituttet for sammenlignende kulturforskning, Serie B; Skrifter, XXXVIII, 1, 2).

The 'Instituttet for sammenlignende kulturforskning' (Norvegian Institute of Comparative Cultural Research) decided, in 1928, to undertake comparative studies on the forms of evolution of the peasantry also including, in the program of work, the study of the system of Alpine pasturage. This is worth while because Alpine pasturage is a very ancient form of soil occupation which has remained both in Norway and, under more or less similar aspects, in Europe and outside the continent. The said Institute has made every effort to assemble and elaborate the Norwegian documentation on the subject and, at the same time, with a view to establishing a basis for the use of a comparative method, has given information on Alpine economy in other countries.

Of these studies forms part this illustrated work in two volumes of Prof. Dr John FRÖDIN who treats in detail, in an exemplary way, on the Alpine economy of Central Europe, and, it appears all the more valuable in that, in general, to date only locally very limited studies have been made on the question and that, in the literature on the subject, there is a great want of synthetic views on this economy in the more or less large geographically uniform regions.

As indicated by the title, the work is planned to include the Alps, the Riesengebirge, the Black Forest, the Vosges, the Swiss Jura and the Swiss Plateau as being important regions for the investigations of the author. Although the Carpathian region comes within Central Europe, its Alpine economy is not discussed; it should, in fact, be studied separately owing to the diversity of the problems involved depending on different factors.

The object of this work which contains innumerable data of importance, well worth propagating, is to describe the Alpine economy of the different regions according to the same points of view, and to arrange, in the same order, the material collected. Thus for each region, the description of natural conditions (topography, climate, plant cover) is followed by a study on the farming system and on the forms of animal production, as well as a detailed examination of the position and future possibilities of Alpine economy.

The diversity of the material at the disposal of the author made it a difficult task to treat the different regions in the same way, but he overcame this difficulty successfully and has been able to give specialists in the matter a work which will certainly be highly appreciated.

I. M.

SCHMIDT, Jonas, KLIESCH, Joachim und GOERTTLER, Viktor: *Lehrbuch der Schweinezucht; Züchtung, Ernährung, Haltung und Krankheiten des Schweines.* Berlin, P. Parey, 1941, VIII + 391 pp. Price: 18.4 RM.

This work, called by the authors a handbook on pig raising, in reality covers much more than it would seem from the title, being a concise compendium of the knowledge generally recognized today in all branches of pig breeding. Thus, it will not only be useful as a manual for students, but will also be most valuable as an encyclopedic reference book for pig breeders and fatteners, as well as for everyone dealing in some way with porcine production. The data refer chiefly in conditions in Germany, only the breeds raised in this country are described; only the measures for the organization and promoting of pig breeding in the Reich are discussed. Nevertheless, this book merits the attention of specialists in other countries, because, on the one hand, the efforts made in Germany can be apprised and, on the other, outside this country, the pig breeder generally comes up against the same sort of problems which are treated clearly and thoroughly in this work. The problems of breeding, upkeep, feeding and control of diseases are dealt with in an exemplary manner. It is to be regretted that the economic problems of porcine production are not treated; the authors intend to deal with this aspect in a subsequent edition, considering that a general comprehensive view of the subject is not possible at the moment.

I. M.

ANDREOTTI, Aldo: *Il commercio della gomma elastica.* Torino, Società editrice internazionale, 1940, 322 pp., with numerous examples of different standard contracts. Price: 40 Lire, plus 5 per cent.

This very varied book clearly explains the commercial practices in the crude rubber market. In the introductory chapter details are given on the countries where crude rubber originates, its chemical composition and its external characteristics, the role of this fundamental material in modern economy is then described and the future possibilities of its use are discussed. The differences between wild rubber and plantation rubber are indicated in detail, as also their different technical denominations, then the methods of manufacture and the properties of synthetic rubber are described and the part actually played by Italy and that which this country could play in the obtaining of natural and synthetic products are shown. This introductory chapter concludes with statistical data on world production of rubber and its consumption in the different countries. A particularly interesting comparison is made between Italian imports of crude rubber and the advantage obtained in its manufacture.

The main part of this book which covers 208 pages, explains the characteristic practices employed in the rubber market. First the different sorts of crude rubber are described (wild, plantation, synthetic, reclaimed rubber, latex and the different trade types) are described, as also the financial side which influences production in a different way. An exact description follows of the market organization and practices both in the Far East (Singapore, Batavia, Colombo) and in Europe, the chief markets being in England and the Netherlands and others in France, Belgium and Germany. The author also mentions the American and Japanese markets. He devotes a large part of his work to trade technique: first he describes private sale and its rules (these regard the determination of weight, defects, reduction in price, non-execution of the contract, solvency and guarantees), then he speaks of sale by auction of crude rubber and the special rules in force at London, Singapore, Antwerp, Colombo and Batavia. The author subsequently treats on the technique of trade in latex, Revertex, etc. and describes standard types of contracts and their clauses, in general and apart. He concludes the main part of his book by discussing exchange methods and Italian commercial practices.

A special concluding chapter deals with the forming of the prices of the raw product in the country of origin, because it has an important influence on the market price; the organization of the rubber market operated according to the International Rubber Regulation of 1934 is also described. All the data are based on an extensive series of figures and are accompanied by numerous formularies of contracts and other important documents.

In its ensemble, this book is a valuable description of the important processes of the rubber market which never before had been explained in this detailed manner.

C. A. G.

NEW PERIODICALS RECEIVED BY THE LIBRARY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE for the second quarter of 1942 (*).

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FRANCE. Secrétariat d'Etat au travail. Bulletin officiel du Secrétariat d'Etat au travail; Textes officiels. Paris, Imprimerie nationale, 1940/41–, bimens. 225 fr. int. (Etat français).

GEBIRGSFORST; Fachblatt für die praktische Forstwirtschaft in Gebirgs- und Hochgebirgsgegenden. Wien, Georg Fromme & Co., v. 23 (1941)–, mens. RM. 8.–

INTERNATIONALE Agrar-Korrespondenz; Pressedienst für Agrarwirtschaft, Agrarwissenschaft, Agrartechnik. Berlin, Landwirtschaftliches Pressebüro Dr. Wilhelm Engelbart, v. 1 (1942)–, hebd. [Processed].

(MLADA balgarka) Млада българка; списание за просвѣта, общественъ животъ и домашна култура. София, v. 1 (1940/41), Monthly except July and August. Leva 80 [Young Bulgarian woman].

MUSTER BETRIEB. Krakau, Agrarverlag, v. 1 (1941)–, bimens. Zł. 48.– [Text bilingual: German and Polish. Second title Polish: Wzorowa gospodarka].

ORAČ; za bodočnost slovenskega kmeta. Ljubljana], v. 1 (1940)–, mens. L. 20.– [Agriculturist; for the future of the Slavonic peasant].

POLJODJELSKA znanstvena smotra. Zagreb, Poljodjelsko-šumarski fakultet i Ministarstvo seljačkog gospodarstva u Zagrebu, 1939–, irr. [Second title in Latin: Revisio scientifica agriculturae]. [Contents and summaries also in German].

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ROLNIK; ilustrowany tygodnik rolniczy. Kraków, Wydawnictwo rolnicze, v. 1 (1941)–, hebd. Zł. 13.44 [Agriculturist].

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VITAMINE und Hormone; Zentralorgan für das gesamte Forschungsgebiet. Leipzig, Akademische Verlagsgesellschaft Becker & Erler Kom.-Ges., v. 1 (1941)–, irr. RM. 35.–

WEEKBLAD voor bloembollencultuur, waarin opgenomen: Het kweekersblad; officieel orgaan van de Algemeene vereeniging voor bloembollencultuur. Haarlem, v. 49 (1938/39)–, hebd. [Weekly journal for the culture of the flowering bulbs and Breeders' journal, combined. Official Organ of the General society for the culture of flowering bulbs].

ZAAIZAAD en pootgoed... tevens officieel orgaan van de Nederlandsche algemeene keuringsdienst. Nieuw-Helvoet, Grootenboer, v. 4 (1942/43)–, mens. fl. 3.– [Seed and seedplants... also official organ of the Dutch institute for the control of seed and seedplants].

(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice monthly); bimestr. (every two months); déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular); mens. (monthly); nº (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

N. B. — Between brackets [/] are given translations and explanatory notes not appearing in the title of the review.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

PRINTING OFFICE CARLO COLOMBO — ROME, JUNE 24, 1942.

PLANT PROTECTION

INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

BELGIUM.

A Review of the Colorado Beetle Situation in 1941 †

1414 communes were infested by the Colorado beetle (*Leptinotarsa decemlineata*) in 1941 as follows:—

Province of Antwerp	88	out of	158
.. .. Brabant	222	.. ..	348
.. .. West Flanders	158	.. ..	253
.. .. East Flanders	282	.. ..	297
.. .. Hainaut	198	.. ..	443
.. .. Liége	56	.. ..	373
.. .. Limburg	76	.. ..	206
.. .. Luxemburg	127	.. ..	233
.. .. Namur	207	.. ..	266

Number of communes infested annually by the Colorado beetle since its introduction into the country:—

Years	Number of communes infested	Number of foci
1935	22	30
1936	45	116
1937	17	39
1938	1,226	—
1939	1,516	—
1940	826	—
1941	1,414	—

* Under this and the next heading the countries are arranged in French alphabetical order.

† Communication from Professor R. MAYNÉ, Director of the State Station of Entomology, Gembloux, Belgium.

SPAIN.

A New Method of Controlling Ink Disease of the European Chestnut *

The European chestnut which in Spain is a source of wealth, is seriously menaced by ink disease caused by the fungus *Phytophthora cambivora* Petri. Chestnut groves are being decimated by this disease.

Damage was first noted in the last century, but the most serious losses occurred in the present century.

It appears that the parasite is propagated from two different foci. One originating in France and penetrating into Spain from Guipuzcoa and Navarra, the other probably starting in Portugal invading first Cáceres, Orense and Pontevedra; subsequently infection spread to La Coruña, Lugo, León and the Asturias, while from the first focus, infection spread from the Cantabrian Mountains to the East and West.

At present, there are about 5 million chestnut trees in production in Spain. One of the provinces which has suffered the least is Lugo where the number of trees has dropped to half within the last 25 years. In La Coruña, the trees are less than a sixth part of the number flourishing at the beginning of the present century, and at Pontevedra, this source of income is practically exhausted. For example, there are communes which formerly owned over 100,000 chestnut trees and which to-day do not even count 100.

If this serious disease is not rapidly controlled, it will practically destroy this source of wealth within a short time and will probably reduce it by at least a quarter within 15 years at the most, if it continues at the same rate.

During 1934, D. Pedro Urquijo Landaluze, Agricultural Engineer, Director of the Phytopathological Station, La Coruña, began experiments for the control of this disease with a new method consisting in treating the underground part of the trunk and the base of the roots with an insoluble copper salt (generally copper carbonate) previously mixed with an adhesive liquid. The experiments carried out on a variable number of chestnut trees (up to 75 per test) were: 2 in 1934, 7 in 1935, 2 in 1936, 1 in 1937, 3 in 1938 and 6 in 1939. The tests were effected in the Provinces of Oviedo, La Coruña, Lugo, Orense and Pontevedra.

The results obtained could not have been better. In fact, only a few trees, those not severely attacked, withered, while still living are other trees which appeared about to die off during the year when treated, as more than half of the circumference of the trees was attacked by the fungus. Nearby untreated trees died off. This proves that the treatment is effective, not only as a preventive measure as was first thought but also as a means of controlling the disease.

* Communication from the official correspondent of the Institute, Mr. José del Cañizo, Agricultural Engineer, Central Station of Phytopathology, Madrid, Spain.

The cost of the treatment, calculated according to prices in 1938, for one experiment on 156 trees in the Asturias was 1.20 pesetas per tree, for the copper carbonate and 1.40 pesetas for the manual labour, with a non-specialized staff.

In 1941, according to the provisions of the Department of Agriculture, the Urquijo method has been extended to a large number of chestnut groves comprising thousands of trees.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Argentine Republic. — Resolution No. 20.043 of April 24, 1941 designates a Committee commissioned to study the possibility of reducing to a single operation the double inspection (sanitary and chemical) to which at present certain agricultural products imported from Chile are subjected. (*Boletín Oficial de la República Argentina,* Buenos Aires, 28 de julio de 1941, año XLIX, núm. 14.080, pág. 2).

*** Resolution No. 20.391 dated May 13, 1941 convokes a meeting of functionaries with a view to proposing the modifications considered opportune to the regulations in force regarding the export of fresh fruit. (*Ibid.*).

Brazil. — Decree-Law No. 3.265 of May 12, 1941 institutes a phytosanitary tax which will be applicable to all plants, parts of plants and also to nurseries and commercial agricultural establishments subject to inspection or any other measure of a phytosanitary character.

Exemption from this phtosanitary tax is allowed for:

(*a*) plants or parts of plants in transit through national territory;

(*b*) inspections or treatments effected on plants or parts of plants pertaining to the Union, to the States or to the communes or which are destined to same, as well as the inspection of agricultural establishments maintained by the public authorities;

(*c*) small quantities of plants transported by travellers in their luggage;

(*d*) plants or parts of plants living or dried, cultivated, produced or worked in the countries with which Brazil has conventions or agreements and after it results that an identical treatment is applied to Brazilian products.

The phytosanitary tax will be collected according to the tariff annexed to this Decree-Law. (*Diario Oficial,* Secção I, Rio de Janeiro, 14 de maio de 1941, ano LXXX, n. 109, pag. 9416-9417).

Spain. — A Ministerial ' Orden ' dated October 25, 1941, establishes the regulations to be followed in locust control. (*Agricultura,* Madrid, noviembre 1941, año X, núm. 115, pág. 439).

United States of America. — In regulation 8 of the Mediterranean fruit fly [*Ceratitis capitata*] and melon fly [*Bactrocera cucurbitae*] quarantine, relating to the inspection of vessels, boarding and inspection of vessels arriving from Hawaii has heretofore been restricted to daylight hours, primarily because of limitations in inspection personnel.

In order to expedite movement under existing emergency shipping conditions an Order of the Secretary of Agriculture, dated May 10, 1941, permits boarding and inspection of vessels arriving from Hawaii during the night period, on condition that notice of the arrival of the vessel is given to the inspector far enough in advance to enable him to make the necessary arrangements for the inspection. (*Federal Register*, Washington, May 13, 1941, Vol. 6, No. 93, pp. 2374-2375).

Italy. — By Ministerial Decree dated September 3, 1941 the territory of the commune of Montedinove, Province of Ascoli Piceno, has been declared infested with grape phylloxera. (*Gazzetta Ufficiale del Regno d'Italia*, Roma, 10 settembre 1941, anno 82º, n. 214, p. 3584).

⁂ Ministerial Circular No. 160 of October 19, 1941 calls the attention of the competent authorities to the opportuneness of making provision for the control of sparrows and starlings with a view to protecting wheat and rice sowings. (*Bollettino Officiale del Ministero dell'Agricultura e delle Foreste*, Roma 11 novembre 1941, anno XII, n. 32, pp. 2082-2083).

Peru. — A Resolution of July 19, 1941 establishes that while the Technical Services of the 'Dirección de Agricultura y Ganadería' of the Ministry of 'Fomento y Obras Públicas' are examining the possibility of disinfecting with definite effect, flax seed produced in fields attacked by 'pasmo' (*Phylyctaena linicola* [= *Septoria linicola* = *Sphaerella linorum*]). or of promoting the cultivation of the flax plant in the Cajamarca Department, the transport and sale of flax seed produced in the said Department, whatever the locality, as well as its utilization for sowing are prohibited.

The producers or possessors of seed originating in this Department are required to communicate immediately to the 'Dirección de Agricultura y Ganadería', the stock of seed in hand, place where held, the quantities sold or place where they may have deposited quantites which they hope to collect, as well as place of production.

Any farmer who may have already sown seed produced in the Department of Cajamarca must report to that effect to the said Division.

Persons or enterprises who may know of the existence of linseed produced in the said Department and belonging to a third party, or sowings effected with such seed must, in their interest, inform the same Division.

Infringements of these provisions will be punished by confiscation of the seed, destruction of the sowings and penalties up to 1000 'soles'. (*La Vida Agrícola*, Lima-Perú, agosto 1º de 1941, vol. XVIII, no. 213, pág. [651]).

*** In order to prevent the introduction into the country of the coffee-berry borer (*Stephanodores hampei*), a Resolution of July 19, 1941 prohibits the import into and transit through the territory of the Republic of all coffee plants or parts of plants as also of coffee beans, whatever the purpose for which they are intended. (*Ibid.*, pág. 656).

*** A Resolution dated July 19, 1941, declares the Majes Valley in the Arequipa Department to be infested with grape phylloxera (*Phylloxera vastatrix*).

In consequence, in the said valley the following are prohibited:—

(*a*) Extraction of vine-shoots and vine plants intended for no matter what other zone in the Republic;

(*b*) Transport of vine-shoots and rooted plants from infested zones to unattacked zones in the same valley, as well as any other rooted plant grown in the infested zone.

Exception is made for young vines which, with the approval of the 'Dirección de Agricultura y Ganadería' are sent to the Majes Valley and intended for re-establishing the vineyards.

The transport of grapes to non-infested valleys will only be allowed if the growers will have, on their own account, attended to the fumigation of the grapes in question, under the supervision of the Agricultural Station of the Department. (*Ibid.*, págs. 656 y 657).

*** By virtue of a Resolution of July 19, 1941, the introduction into the country of the natural enemies of insects, worms and other lower animals harmful to agriculture, may only be effected by the technical organizations of the 'Dirección de Agricultura y Ganadería', by means of preliminary authorization granted by the 'Junta de Sanidad Vegetal' in each case. (*Ibid.*, pág. 657).

*** By Resolution of July 19, 1941, the quarantine measures relative to the importation of cotton from Ecuador [see this *Bulletin*, 1941, Nos. 7-8, p. 144] are extended to castor-oil seeds, husks and presscake, originating in the said Republic, as this material may serve as food and a vehicle for the pink cotton bollworm (*Pectinophora gossypiella*), the presence of which has been ascertained in Ecuador. (*Ibid.*, pág. 659).

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[This authoritative work for the compilation of which Dr de Seabra, naturalist at the Zoological Museum of the University of Coimbra, began his painstaking and laborious researches in 1929, is a detailed compendium of the knowledge acquired up to the present on insects and other animals noxious to wheat in the different countries of the world.
Besides its evident practical utility as a consultation work, this volume of the Portuguese scientist contains data as yet unpublished and in its development breaks away from the general plan usually followed in books on economic entomology.
The volume is divided into four parts not counting the introduction and one appendix.
The first part deals with the ecological and biological study of the species of insects harmful to wheat.
In the second part the entomological problems regarding this cereal in the different continents are examined. A special chapter is given on Portugal.
The third part treats on control measures, particular consideration being given to the natural enemies (parasites and predators) of wheat pests (the plant and the grain).
The fourth part assembles lists frequently containing original indications on the chief insects and other animals harmful to wheat in forty-there countries of the world.
The appendix reviews the Myriapoda, Arachnida, Vermes, Mollusca and Vertebrata injurious to wheat.
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Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

RUMANIA.

Phytopathological Events during the Year 1941 †

The year 1941 was very propitious for the appearance and development of different diseases of cultivated plants.

Mention will be limited here to some new diseases and to those which presented certain marked peculiarities during the course of the year.

Beet Rust.

The most frequently occurring diseases of the sugarbeet in Rumania are leaf spot (*Cercospora beticola* Sacc.), mosaic disease (caused by an ultravirus), dry and heart rot and crown gall (*Bacterium tumefaciens* Smith et Town.).

On September 3, 1941, beet rust caused by *Uromyces betae* (Pers.) Kühn made its appearance for the first time on crops at Cenad, Department of Timis Torontal, Banat. These crops were badly damaged, attack being particularly severe on lots which had been given chemical fertilizers (N, P and K). The most susceptible variety was that bred at the Cenad Experiment Station: 'Cesena C'.

Bitter pit of Pears.

A fairly widespread disease and which causes serious damage to apples is bitter pit ('Stippenkrankheit') which was observed and described for the first time in Rumania in 1934.

This disease is not reported so frequently on pears, but it is known in Australia where it causes heavy damage, in South Africa, in the United States and in England.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Communication from the official correspondent of the Institute, Mr TRAIAN SĂVULESCU, Professor at the Faculty of Agronomy, Chief of the Phytopathological Section at the Institute for Agricultural Research of Rumania, Bucharest, Rumania.

This disorder was again found in Rumania this autumn on pears in an orchard in the environs of Bucharest, on the variety 'Président Drouard'. The disease made its appearance before ripening of the fruit and the diseased pears were deformed, presenting an irregular up and down surface. The affected fruits had a shrivelled appearance. In the sunken parts of the surface, the tegument maintains a green colour contrasting with the rest of the surface which has the yellow colouring of ripe fruit. Brown spots are seen in the inside, like small points, these, however, can be as large as a lentil. The tissue has a spongy aspect, but is hard in consistency, owing to the accumulation of sclereids. The brown spots spread out from the periphery to the carpels enclosing the seeds. The diseased pears have a bitter taste and are not fit for eating. The cause of bitter pit in apples and pears has long been discussed and is still unknown. This disorder has been attributed to: (*a*) different animal or plant parasites (insects, ultravirus, bacteria and fungi); (*b*) various mechanical causes; (*c*) unfavourable soil and climatic conditions.

Today, it is known that this physiological disease is due to a hydric disequilibrium. There are many theories which endeavour to explain how this disequilibrium makes the manifestation of the disease possible. One of these theories sustains that an abundant transpiration stimulated by an abundant absorption of water from the soil results in an increased concentration of the cellular sap, especially in acids, which destroy certain groups of cells, where the brown spots appear. According to another theory, it is considered that pronounced drought prevents the absorption of water from the soil and the indispensable mineral salts. The destruction of the cells in the diseased parts would be due to the deficiency in nutrient salts. Finally, the appearance of bitter pit is explained by the sudden check of transpiration during the night, without the absorption of water by the roots being stopped. In this way, a heavy pressure occurs in the cells of the fruit which burst and perish. The latest theory is based on the observation that the dead cells have a very high starch content. When the starch is changed into soluble sugars, if the quantity of water suddenly increases in the fruit, the cells which contain much sugar have an excessive osmotic pressure and exert pressure on the cells in which the starch has not yet been transformed, and cause the breaking of the cell walls. The cells die, become brown and retain their starch. This theory cannot be accepted as an explanation of bitter pit of pears, as no starch is found in the brown cells in pears. These theories are not based on complete observations and their value, for the moment, remains hypothetical.

Experiments undertaken in the United States prove that abundant irrigation of the trees during growth promote the appearance of the disease; a medium irrigation during the course of vegetation, followed by an abundant irrigation towards the end of vegetation, appreciably favour the appearance of the disease. A moderate irrigation throughout the vegetative period and especially towards the end of the vegetative period maintains the best hydric equilibrium of the trees and prevents the disease occurring.

From what is known up to date on bitter pit, what is certain is that, to a large extent, rational irrigation prevents the appearance of the disease. With

a suitable cultivation technique, the absorption and utilization of water can be regulated and the necessary hydric equilibrium maintained. It is recommended that the orchards should not be too closely planted, that each tree be pruned equally, that the fruits should not be harvested too late in the season and, that susceptible varieties should be replaced by resistant varieties.

Wilt of the Lupin.

Among the legumes which are beginning to have a special importance in Rumanian agriculture are the soybean and the lupin. Some years ago, chiefly the white lupin (*Lupinus albus*) was cultivated. This has gradually been replaced by varieties of the blue lupin (*L. augustifolius*) and the yellow lupin (*L. luteus*) bred in Germany. From the time of their importation (1937-1938), these varieties were attacked by the disease very widespread in Germany called wilt disease (' Welkekrankheit '). The entire plant wilts, the leaves lose their turgidity and drop off the stem. Finally the diseased plants dry up and die off. Wilting begins in the young parts of the plant and continues towards the base. At first the leaves lose their chlorophyll and subsequently, in browning, dry up completely and fall to the ground. Of the diseased plant only the dried stem remains and this can easily be uprooted. Sometimes the disease develops on delimited and isolated areas, but often it covers the whole field. It has been found that the blue lupin is more susceptible than the yellow lupin which again is more susceptible than the white lupin. There is no doubt that this wilting disease was introduced from Germany through the selected seed having spores of the parasite on the seed surface. The disease has been found to be very serious, especially during the crop year 1940-41, being favoured by the very abundant rains.

From the diseased tissues only *Fusarium oxysporum* Schlecht. has been isolated and made into cultures, that is, the same pathogenic agent recognized in Germany as being the cause of the disease. As a means of preventing extension of the disease, the cultivation of other crops on land as yet not infected and the dusting of seed with organic mercury compounds (' Germisan ', ' Ceresan ', ' Abavit ') are recommended.

Rust of *Carthamus tinctorius*.

The cultivation of this oil-yielding plant began to develop from one year to another in our country. A severe attack of *Puccinia carthami* (Hutzelm.) Cda. was reported on crops in the Bucharest region during the month of July, 1941. The fungus was limited solely to the leaves and presented only uredospores and teleutospores.

(*to be continued*).

VARIOUS QUESTIONS

The Mineral Intake and the Resistance of Plants to Microbial Diseases *

The farmer knows that a wet and cold spring and summer do not fill his granary; persistant bad weather, in fact, reduces the activity of the plant and promotes the development and spread of cryptogamic diseases. Consequently it is the sun which drives away the plant parasites at the same time assuring the high yields wanted in crops.

It is still the common opinion of the farmer that the intensity of cryptogamic diseases varies according to the fertility of the soil; thus natural or acquired fertility has also a part to play; that is to say, a plant which can obtain all the necessary elements for its development has a higher resistance to microbial infections than a plant exposed to some mineral deficiency.

The farmer can do nothing against a shortage of sunlight; he can do much towards the vigorousness of vegetation, all his art consisting in maintaining the fertility of the soil. He could easily perform his task if he knew the requirements of the different crops, but these fundamental data are wanting on many points. To attempt to acquire them, it was necessary to await the Pasteurian discoveries as they have contributed the means of making cultures in mediums free from microbes and, consequently, to realize for the higher plants that which Raulin did for *Aspergillus niger*: establish the composition of a nutrient solution which enables the plant to complete its life cycle as well, if not better, as in highly fertile soils. This is the problem which I have resolved using maize as the experiment plant.

It is a matter here of showing what the question is and subsequently considering its relation with the natural resistance of the plant to microbial diseases.

Investigation on the mineral elements necessary for the development of maize.

I began this study in 1899; as a preliminary step it was advisable to compare first the nutritive value of nitric nitrogen and ammoniacal nitrogen; it was thought, at that time, that ammonical nitrogen could not be utilized directly by the plant; its preliminary transformation into nitric nitrogen was considered to be necessary.

Experience has shown that ammonical is equal to nitric nitrogen; their yield in vegetal matter is the same for the same weights of nitrogen used; to establish this essential fact, however, the use of aseptic nutrient solutions was necessary.

* Note of Prof. PIERRE MAZÉ, Pasteur Institute, Paris, France.

The solution I employed at this time had the following composition:—

Sodium nitrate	1
Ammonium sulphate	equivalent quantity
Monopotassium phosphate	1
Magnesium sulphate + 7 H_2O	0.2
Ferrous sulphate + 7 H_2O	0.1
Manganese chloride + 4 H_2O	0.1
Zinc chloride	traces
Potassium silicate	»
Calcium carbonate	2
Distilled water	1000

All these mineral elements exist in the ash of the maize plant where they had already been discovered by analysis; there are others which were not known, but which the salts and the water employed had contributed as impurities and which it was necessary to ascertain. Such as it is, this first result showed that it is a matter of indifference as to whether ammoniacal salts or nitrates are used in solving the problem in question.

The solution of the problem was reported in 1919; those whom these researches interest will find full details in the *Annales de l'Institut Pasteur*, 1899 to 1919.

The nutrient solution which assures the growth of maize in a medium free from microbes, just as well as in the best soils, has the following composition:

Ammonium nitrate	0.235
Monopotassium phosphate	0.5
Magnesium sulphate + 7 H_2O	0.1
Ferrous sulphate + 7 H_2O	0.05
Manganese sulphate + 4 H_2O	0.02
Zinc chloride	0.02
Sodium silicate	0.01
Aluminium sulphate	0.01
Sodium borate	0.005
Sodium fluoride	0.002
Potassium iodide	0.002
Calcium carbonate	2
Distilled water	1000

The properties of this solution vary according to the chemical state of the elements which compose it; the nitrates of ammonium, potassium and calcium are the best nitrogenous nutrients as they are completely assimilable. It is important that all the components of the solution be used integrally by the plant; the sodium of sodium nitrate, the sulphuric and hydrochloric acids of the sulphate and chloride of ammonium which are not assimilable to the same extent as the nitric acid or ammonia of these salts influence the pH of the nutrient solution and on the other hand check the growth of the plant by accumulating in the tissues.

Provided with these data I was able to study methodically the problems relative to the nutrition of maize.

Three series of results were obtained from this study.

The first established the law of physiological relations: the plant takes from the nutrient solution the elements which it needs in the proportions determined to constitute the raw sap. The ideal solution therefore, is that which combines the physiological proportions of the ascending sap. It is recognized

that a solution fills these conditions when the plant absorbs it without leaving any residuum; if the solution is too concentrated, the roots absorb proportionally more water than salts, the solution condenses and vegetation stops; if the solution is too weak, the roots take proportionally more salts than water, the solution soon loses its strength and vegetation stops owing to the excess of exhausted liquid.

A direct consequence of this law is the existence of a constant relation between the volume of physiological solution used for each species and the weight of the plant matter developed, the external conditions being the same.

Another interesting consequence is the faculty of the roots to select the nutrient salts. This faculty comprises the possibility of an ionic absorption generally admitted moreover; however, this mode of absorption cannot be brought forward in a conclusive manner with the use of a sole solution, but the utilisation of pots with two independent capacities enabled me to decide the question and show that the nitric nitrogen and ammoniacal nitrogen of the ammonium nitrate dissolved in distilled water, are absorbed preferably one by one according to the nature of the nitrogenous compound in the complete solution which feeds the plant.

The ionic absorption as well as the molecular absorption, on the other hand, explain that a plant absorbs, according to the nature of the soil, the elements which characterize these soils, indifferent or even noxious.

Therefore, the nutritive value of all the mineral elements found in the ash of a plant cannot be decided through analysis; direct experimentation is the sole means of settling this point.

Influence of the mineral elements in a complete solution on the growth of maize.

The second series of results comprised the respective effects of the elements in the nutrient solution on the growth of maize.

If the solution is deprived of one of the following substances, N, P, K, Ca, Mg, which are utilized in relatively high quantities, the seedling does not develop.

If, on the contrary, it is one of the elements that the seedling only utilizes in minimum doses which is wanting, the few milligrams or fractions of a milligram contributed by the seed assure a good start in growth; the plant develops normally for several days, sometimes several weeks, then growth slows down, while at the same time other deficiency symptoms appear; these symptoms consist in complete decoloration of the leaves (iron and sulphur deficiency) or in a less marked chlorosis (Mn, Zn, Bo, etc.) accompanied one or the other by a considerable reduction in the aerial parts, and leading to a more or less rapid dying-off.

It is in ascertaining the means of remedying these mishaps that the role of the sun was shown under an unsuspected aspect.

Only the essential part which it plays in the resistance of the plant to chemical intoxications and microbial infections will be considered here.

The study of the effects of mineral deficiencies on the plant will enable us to define it.

(to be continued).

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — By Ministerial Provision of November 7, 1941, based on the Decrees of March 28, 1929 and September 30, 1932 [see this *Bulletin*, 1929, No. 6, p. 83 and 1932, No. 12, p. 205] with a view to preventing the introduction of the carnation leaf roller [*Tortrix pronubana*], the importation of carnations (cut flowers) from Italy, Denmark and the Netherlands is authorized from November 15, 1941. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Dezember 1941, 21. Jahrg., Nr. 12, S. 88).

Germany (Alsace). — A Decree dated October 29, 1941 introduces into Alsace the measures relative to the control of fruit crop diseases and pests, similar to those laid down for the Reich by Decree of October 29, 1937 [see this *Bulletin*, 1938, No. 5, pp. 100-101]. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Dezember 1941, 21. Jahrg., Nr. 12, S. 88).

Germany (Protectorate of Bohemia and Moravia). — The Ministerial Notification No. 828 dated October 7, 1941 publishes the list of preparations which are exempt from the provisions of December 5, 1940 [see this *Bulletin*, 1941, Nos. 7 & 8, p. 142] relative to the supervision of and trade in products intended for use in plant protection. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Dezember 1941, Bd. XIII, Nr. 8, S. 284-285).

Germany (Prussia). — A Decree dated October 30, 1941 renders the clearing of thistles in the Stade district compulsory.

The thistles (*Cirsium arvense*) should be cut or uprooted so that none may attain maturity. The necessary operations should be concluded before July 1. In fields grown to cereals, however, the control of thistles will have to be undertaken fairly early in order to avoid damaging the crops to any extent through control operations. Control operations will be supervised by the police authorities and the Plant Protection Service. This latter may, in agreement with the mayors of the communes in question, engage persons duly authorized to inspect all fields and to denounce any eventual recalcitrants. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Dezember 1941, Bd. XIII, Nr. 8, S. 282).

Morocco (French Zone of). — An Order of December 5, 1941, authorizes the destruction of rabbits causing damage to crops and plantations in the Rabat region. (*Bulletin Officiel*, Rabat, 26 décembre 1941, XXX^e année, n^o 1522, p. 1195).

Switzerland. — By Ordinance No. 1 of the War Office for Industry and Labour and the War Office for Nutrition, dated November 25, 1941, the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour is authorized to decree measures on production, stocks and the system of compulsory delivery of copper salts and copper preparations intended for use in plant protection.

This Section, in particular, will be in a position to lay down a program of production and demand its execution by the producers.

The Section of Chemical and Pharmaceutical Products, in agreement with the Section for Metals of the War Office for Industry and Labour, will establish the quantities of copper to be allotted for the production of copper salts and copper preparations intended for use in plant protection.

The distribution and utilization of copper salts and copper preparations intended for use in plant protection will be regulated by the Section of Chemical and Pharmaceutical Products in so far as regards the requirements of industry, handicrafts and the army, and by the Section of Fertilizers and Utilization of Waste Products of the War Office for Nutrition, as regards agricultural requirements.

In particular, these two Sections will have the power: (*a*) to ration, to contingent or subordinate to a preliminary authorization the delivery and purchase; (*b*) to prohibit, for certain uses, the utilization of copper salts and copper preparations intended for plant protection; to prescribe the use of substitute products and to take, as regards consumption, any other measure which may be found necessary to assure an economic utilization of copper salts and copper preparations intended for use in plant protection.

The Section of Chemical and Pharmaceutical Products and the Section of Fertilizers and Utilization of Waste Products are authorized to prescribe the necessary control measures, to carry out enquiries and oblige persons and enterprises engaged in production, elaboration and trade, as well as the holders of stocks and consumers, to keep registers and also to report periodically.

Each is required to give all information on the matter to the Services charged with the supervision of the products, and, if necessary, to produce justificatory documents.

The agents for inspection may enter into workshops, stores and other localities of enterprises and have access to all documents found therein and, as the case may be, ascertain the arrangement. They may also interrogate any person with a view to obtaining information.

In the case of necessity, the cantons are required to lend the assistance of the police.

When a person or enterprise contravenes this Ordinance, the measures to be carried out or the decisions of the case in point, or when he or it, by his or its behaviour, necessitates inspection operations, the costs of these operations will be charged to the said person or enterprise.

Whosoever infringes this Ordinance or the measures to be executed is liable to a penalty of 30,000 francs (maximum) or imprisonment for twelve months (maximum).

The two penalties may be cumulative. Negligence is also punishable.

According to Article 4 of the Decree of the Federal Council dated June 25, 1941 aiming at assuring the supplying of the population and the army in raw materials for industry and in semi-manufactured or manufactured products, the contravener will be excluded from all participation in the delivery of copper salts and copper preparations intended for use in plant protection and the

permits which were granted him will be withdrawn and, according to the Decree of the Federal Council, dated November 12, 1940, his sales premises and workshops, factories and other enterprises will be closed preventively. (*Recueil des lois fédérales*, Berne, 27 novembre 1941, nº 56, p. 1383-1385).

*** The instructions decreed on the same date by the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour lay down that no one may deliver nor purchase copper salts for the requirements of industry, handicrafts and the army without authorization from the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour.

Renewal of stocks of copper salts for the requirements of industry, handicrafts and the army cannot be effected without authorization, neither from the producer to the merchant, nor between the different branches of trade. Written application for this authorization must be made to the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour. (*Ibid.*, p. 1386).

*** The instructions decreed on November 25, 1941 by the Section of Fertilizers and Utilization of Waste Products lay down that no one may deliver or purchase copper salts and copper preparations for use in agriculture without ration vouchers.

The delivery of ration vouchers is regulated by special instructions of the Section.

Mixed powder preparations containing less than 2 per cent. of metal copper, employed for truck crops and in horticulture, may be delivered and purchased without ration vouchers.

The delivery, purchase and use of these powder preparations in winegrowing are prohibited.

The supplying of copper salts and copper products intended for use in agriculture, between the different branches of trade, from the producer to the retailer, is subject to the authorization of the Section. (*Ibid.*, p. 1387-1388).

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In the subsequent pages, the diseases of the following plants are successively discussed: cereals, herbaceous legumes, potatoes, tomatoes, tobacco, beets, hemp, flax, truck crops, vines, peaches and other drupaceous plants, pomaceous plants, the olive, mulberry, fig, citrus, walnut, chestnut, elm and oak. Some pages following deal with the poisoning of plants due to the presence of noxious gaseous substances in the environment].

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INTERNATIONAL BULLETIN
OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

ITALY.

A Bacterial Soft Rot of Capsicum Fruits †

In November 1939, observing a field of capsicum or pod-peppers (*Capsicum annuum* L.) in the garden of the Agricultural Technical Institute at Todi in the Province of Perugia, field which showed numerous fruits rotting as a result of an attack of *Botrytis*, of the *vulgaris* type, my attention was attracted by a dense, viscid, yellowish-green brown liquid of unpleasant odour contained in some of the diseased fruits.

A close examintion showed soft, rotting fruits not affected with *Botrytis*, but partly filled with this viscid liquid, and also fruits without this liquid though infested by the fungus and also rotting, dry or soft according to the more or less advanced stage of the disease.

The examination under the microscope of the malodorous liquid contained in the fruits rotted by some action other than that of *Botrytis*, revealed a myriad of very mobile bacteria measuring $1.0\text{-}1.5 \times 0.3\text{-}0.5\ \mu$ which presented practically the character of a pure culture. This liquid extracted by a syringe from the interior of a fruit having a perfectly intact epidermis, reproduced the disease in 4-5 days when inoculated into a sound fruit.

The contagious and virulent character of the liquid contained in the rotting fruits thus being established and found not to be caused by *Botrytis*, I considered that the soft rot of capsicum-pods observed by myself as to be attributed to two different causes: (*a*) *Botrytis* which was discussed in a note published in 1941; (*b*) a bacterium which is now treated in this communication.

Characteristics of the Disease.

This soft rot of bacterial origin attacks the pods in any stage of ripening and in any part, preferably at the base of the peduncle. Within a few days it spreads over the whole fruit while a dense viscid liquid of repellent odour resembling that of spoiled pickled chillies, accumulates in the tip.

* Under this and the next heading the countries are arranged in French alphabetical order.

† Communication from Professor GIUSEPPE ORSINI, Director of the Phytopathological Laboratory, R. Istituto tecnico agrario 'Augusto Ciuffelli', Todi, Italy.

Unripe green pods attacked by the disease show an olive-brown coloured spot which in 8-9 days spreads throughout the entire healthy tissue, while on ripe fruits (yellow or red), the infested area presented the usual softening without any change in the colour of the variety.

In consequence of the activity of the pathogenic agent, the parenchymous tissue of the fruit breaks down into a shapeless soft mass which, offering no resistance to a razor edge, made it impossible to obtain sections in order to carry out in the fresh state an anatomical pathological study of the histological disorder. With the advance of the disease, the decayed tissue is transformed into this dense, viscid and fetid liquid loaded with bacteria which macroscopically constitute the outstanding characteristic of this bacterial disease peculiar to capsicum pods. The epidermis is not attacked by the pathogenic agent and, remaining intact, stretches under the weight of the liquid which accumulates in the tip of the fruit which thus assumes the aspect of a cone with the top towards the ground. The epidermis subsequently breaks owing to biological and abiological causes and the liquid is discharged frequently falling on the pods lower down the plant and leading to further infestation. It also frequently happens that the wall of the fruit is detached completely from the calycinal disc owing to the rotting of the latter, so that the plant continues to bear the base of the fruit with or without shreds of the epidermis which on drying acquire the aspect and consistency of parchment.

Indications on the Causal Agent.

The examination of the morphological, cultural and physiological characteristics shows that the bacterium under consideration differs entirely from *Bacillus coli* (Escherich) Migula var. *capsici* Passalacqua, observed in 1931 near Palermo as cause of a dry rot of capsicum pods; and from *Bac. capsici* Pavarino et Turconi, found in 1912 in gardens in Bergamo and Treviglio and also *Bacterium exitiosum* Gardner et Kendrick (= *Bact. vesicatorium* Doidge), cause of bacteriosis of capsicum leaves.

Although the bacterium I studied in a few rare instances reproduced, through inoculation, the disease on tomato fruits, there are no grounds for considering it identical with *Bact. briosii* Pavarino as regards microbiological nor pathogenetic characteristics. In fact, when the disease takes a hold of the tomato, it shows characteristics very different to those caused by *Bact. briosii*, spreading in a few days to the whole fruit, which, while maintaining its normal colour, changes into a shapeless mass from which a semi-fluid liquid, formed in abundance inside the fruit through the disintegration of the tissues, drips. On the other hand, there is an affinity between the characteristics of the microorganism, subject of this report, and the chief morpho-physiological characteristics of *Bact. syringae* (van Hall) E. F. Smith indicated by different investigators. Even in this case, however, a complete identity between the two microorganisms is wanting because for *Bact. syringae* the diagnoses of the different scientists do not fully agree, showing differences which if sometimes they are only apparent, in other cases, on the contrary, are fairly perceptible

Chiefly the phytopathological characteristics of the bacterium studied by myself differentiate from those of *Bact. syringae.* In fact, inoculation of lemon plants and herbaceous shoots of the lilac and pear, kept in a water tank under a bell-glass, always gave negative results.

If it is taken into consideration, however, that the diseases of different plants produced by fluorescent bacteria are today attributed to *Bact. syringae*; that the parenchymous tissue is affected in the histological disorders caused by this bacteria; that the predisposition of the host plant to the development of *Bact. syringae* is represented by cold, humidity, wounding; that this microorganism is also subject to variations in pathogenic capacity, it is probable that the species I studied corresponds, owing to the cultural, morphological and biochemical affinity it shows with *Bact. syringae*, to a biological race of this latter species with adaptation and specificity to capsicums. It is not hazardous to consider, although with reserve, as serological tests and a comparative study of the verified stocks of *Bact. syringae* have not yet been carried out, that this species constitutes a 'group species', that is, a species which comprises sub-species or races or varieties varying slightly from each other but evidently belonging to the same species, as has been ascertained for *Bact. tumefaciens* Smith et Townsend, for *Bac. carotovorus* L. R. Jones and for other pathogenic microorganisms affecting plants, man and domestic animals.

For these reasons I think I am justified in considering the bacterium studied as a new variety; *Bact. syringae* (van Hall) E. F. Smith var. *capsici* n. var. G. Orsini.

Influence of Environment on the Disease.

The disease was encountered at the beginning of November, 1939 following some days of rainy weather, accompanied by a fall in temperature causing thick and persistent mists sometimes lasting the whole day.

The disease rapidly spread throughout the field and as it was abandoned by the grower, I was able to follow its development fully.

In 1940, the disease did not occur in the summer but began to reappear at the end of October, after the first autumn rains.

It appeared in 1941, having an epidemic character, during the cold and wet period in October-November.

I consider, therefore, that the disease is accompanied by great humidity and a low temperature, so that with the climate of Umbria, in a normal year, it would only affect the late crop of capsicums; other predisposing causes are wounds due to various reasons, as also a slight separation of the calycinal disc from the wall of the fruit. Even the evidence that the disease frequently begins at the base of the fruit, which, owing to its natural more or less concave shape facilitates the stagnation of water or virulent liquid from a diseased pod placed higher up confirms that the place of insertion of the fruit at the peduncle represents a way of infiltration for the parasite as is the case for different species of *Botrytis* and other species of pathogenic fungi.

Control Methods.

As the soft rot of bacterial origin attacking capicum pods only makes its appearance during the final stage of the vegetative cycle of this plant, it cannot be checked by means of the usual anticryptogamic substances, because between the time of application and harvesting, the period is not long enough to guarantee complete removal of the product employed, by the rains.

It is advisable, therefore, to harvest the last crop at the beginning of the autumn rains, even if the pods are not yet ripe provided that they fulfil trade requirements, and to destroy by fire all diseased fruits as well as all crop trash.

RUMANIA.

Phytopathological Events during the Year 1941 (*concluded*) *

Rot of Sunflower Heads.

Like all plants, the sunflower has numerous plant enemies which sometimes attack and destroy it in great numbers. Among these pests, the most important, known up to 1934, in our country were rust (*Puccinia helianthi* Schw.) and *Orobanche cernua* Loefling var. *cumana* (Wllr.) Beck, which for several years caused serious damage in Bessarabia and in the Department of Brăila in 1935.

Recently, a new and just as serious a disease appeared taking the form of rotting at the root and collar of the plant. This disease is caused by *Sclerotinia libertiana* Fuck. It was reported for the first time in Rumania in 1933 in fields at Giurgiuveni (Department of Ialomiţa), and subsequently in other districts, particularly at Tg. Frumos (Department of Iaşi).

During the summers of 1940 and 1941, it was found that sunflower heads were also attacked by a rot which caused very severe damage. The results of investigations carried out abroad together with our own observations show that this rot is always due to *Scl. libertiana*, which also brings about root and collar rot. It is a question, therefore, of the same disease, appearing in slightly differing forms owing to the fact that it develops on other parts of the plant and under exceptional climatic conditions.

The forms of rot produced by *Sclerotinia* on the sunflower as well as on a large number of cultivated or stored plants are diseases which have long been known in other countries.

They were mentioned for the first time by De Bary in 1886, and subsequently by Frank and Kirchner in 1897. In Great Britain, in 1917, a report was published in which the sunflower was indicated as the preferred host plant of *Sclerotinia*. In the following years, it was again cited by other investigators and reported in different parts of Russia, the United States (Montana) and Canada (Manitoba).

* Communication from the official correspondent of the Institute, Mr TRAIAN SĂVULESCU, Professor at the Faculty of Agronomy, Chief of the Phytopathological Section at the Institute for Agricultural Research of Rumania, Bucharest, Rumania.

In 1925, Rogatsch Maljutin described an attack in Russia of *Scl. libertiana* on the sunflower which had caused damage since 1923 and which had gradually increased in intensity. For the first time the appearance of this disease was reported on the inflorescences. According to this investigator, the inflorescence is the part most susceptible to infection by the mycelium of the fungus. The infection of one floret at the edge of the flower head is sufficient to change the inflorescence in a few days into a mucilaginous mass of mycelia and sclerotia.

The fullest report and also the nearest to our observations was that made by Atanasoff in Bulgaria during 1934. He reports this disease on numerous plants of considerable economic importance such as tobacco, beets, carrots, gherkins, melons, salad vegetables, tomatoes, beans, sunflowers, cabbages, rape, potatoes; earth-nuts, etc. Atanasoff considers the sunflower as one of the plants most severely attacked by this fungus. In Bulgaria and Central Russia, along the Volga, in Ukrainia and in the Caucasus, damage rose as high as 80 per cent. The fungus attacks all parts of the plant from the root to the fruits. This investigator gives a detailed description of the aspect of the disease on the root, the collar, flowers and fruits. Numerous scherotia have been found on the parts attacked. The imperfect form (*Botrytis*) was also observed on earth-nut plants attacked by this fungus.

The disease reported in Rumania in 1933 appeared first on the main roots and the collar. In wet weather, the parts attacked appeared as if scalded and were covered with a thick layer of mycelia; in dry weather, they had a dry and wilted aspect. At the same time the leaves also wilted. Wherever the disease appeared, the plants rotted and many of them were bent and broken.

This rot was subsequently reported in other regions of the country. The losses caused amounted to 10-15 per cent. and even higher, particularly in wet localities, in the depressions.

On the surface of the parts attacked and on longitudinal sections taken from the root and collar of diseased plants, in the region of the pith were found numerous elongated, black sclerotia, disposed in series, from the size of a lentil up to a bean.

In these areas, the fungus transforms the part into a mass of vascular bundles, surrounded by a decomposed parenchyma.

The investigations carried out by us have proved that this rot is caused by *Scl. libertiana*.

During the autumn of 1940, in September, rot of the flowerheads was observed in a sunflower field at Băneasa. The attack was very intense and the diseased inflorescences became useless.

The disease manifested itself by the softening of the flowerheads from their point of insertion up to the edges. At th's time the heads bore fruits, but in the area where the attack occurred, the achenes remained small; the majority were shrivelled and the kernels had turned a brownish yellow colour. Softening of the tissues takes place not only in the flowerheads, but also at the base of the fruits in the infected part of the thalamus. On the attacked part, both on the upper and lower surface, at the insertion of the fruits and on the withered fruits

were found numerous sclerotia some millimetres in diameter, elongated, irregular having a hard carbuncled wall. On the lower side of the flowerhead, the sclerotia were surrounded by a mycelium of a greenish gray colour, bearing conidiophores of the *Botrytis* type. This same mycelium subsequently appeared among the seeds. The collar and root of plants with diseased flowerheads had a healthy aspect and no sclerotia were found in the pith. In 1941 this flowerhead rot had spread practically throughout the country, in some places (for example in North Moldavia) causing as much as 70 per cent. damage.

Our observations, which confirm those of other investigators, indicate that humidity plays an important part in the development of the disease. The severe attack of 1934 affecting the collar and roots of the plants occurred in the depressions where humidity is greatest. The infection observed on flowerheads, during the years 1940 and 1941, developed following an extremely rainy summer. Even, in September, when the attack occurred after a few days rain, the rot had invaded the heads to such an extent that it was difficult to find specimens showing intermediate stages.

The optimum temperature for the development of this fungus varies between 17 and 20° C. as seen from our laboratory experiments using inoculated cultures on artificial media; high temperatures checked the development of the disease.

According to Atanasoff, this rot often occurs on young sunflower plants as well as on other young plants. In Rumania, this fungus was only observed on full-grown plants, in the two aforesaid forms: at the base of the stalk and on the flowerheads.

As regards the resistance of the different varieties, according to observations made in Russia, it appears that all the varieties are equally attacked and that the fungus does not present physiological races.

In the experiment field at Băneasa, where three strains were cultivated (one having black seed, another with spotted seed and the third with white seed), it was seen that the white-seeded strain was attacked the most; the black-seeded strain showed greater resistance.

Among the first measures to be taken is the uprooting of the diseased plants and their destruction by burning. The cultivation of the sunflower should be avoided in the depressions and humid regions which become favourable for the development of the disease during wet years. In view of the great resistance of the sclerotia, this plant should not be cultivated on the same fields for some years after the first infection. The sunflower should be grown in rotation with other crops which are not attacked by this fungus, for example, with cereals or pulses which are less affected. Healthy, sound seed must be used: any sclerotia on the fruit germinates and the mycelium which results would infect the root and collar of the plants even in non-infected ground.

We are of the opinion that deep ploughing diminishes the infection of the mycelium which is found on the diseased parts, as well as that of the sclerotia buried in the soil.

The application of fertilizers does not appear to have any influence on the development of the disease.

Leaf Spot of *Caragana arborescens.*

In the gardens of the town of Chişinău, Department of Lăpuşna, in September, the leaves of *Caragana arborescens* showed yellowish, subsequently darker, irregular spots, covering practically the whole leaf surface. At the place of the spots were spherical pycnidia which emitted white spore chains measuring up to one millimetre in length. The bacillary spores, presenting 1-3 transversal partitions, were straight or flexuous, hyaline and measured 34.14-55.66 × 2.78-4.14. The characteristics of this fungus corresponded completely to the diagnosis of *Septoria caragenae* P. Henn. reported only in Germany and discovered this year for the first time in Rumania.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — By Ordinance No. 28 of January 3, 1941 relative to the distribution to those concerned of borax and anticryptogamic preparations and insecticides containing copper, it is established that the products in question may only be delivered by dealers on presentation of a permit authorizing purchase. However, copper preparations for destroying weeds as also certain anticryptogamic preparations and insecticides having a low copper content may be sold without restriction. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Januar 1942, 22. Jahrg., Nr. 1, S. 4).

⁂ An Ordinance dated October 10, 1941 relative to permits for the purchase of anticryptogamic preparations and insecticides supplements the provisions of January 3, 1941 summarized above.

The permits in question will be provided with different coloured coupons: blue for copper sulphate, green for copper preparations. The red-coloured permits authorizing the purchase of borax have been suppressed.

The coupons cannot be utilized to obtain preparations other than those officially recognized by the Central Plant Protection. Interested parties, to obtain these permits, should make an application to the authorized distribution Centre indicated by the Plant Protection Service. (*Ibid.*, S. 4-5).

⁂ The police regulations ('Polizeivorschriften') relative to the transport of plants [see this *Bulletin*, 1940, No. 6, p. 122] have been brought up to date by a rectification valid up to June 1, 1941 (*Ibid.*, S. 5).

Germany (**Alsace**). — Two Ordinances dated October 27, 1941 regulate the trade in toxic preparations utilized in plant protection, as also the trade in poisons, by adapting the provisions regarding same already in force throughout the remainder of Germany by virtue of the Ordinances of January 11, 1938 and February 13, 1940 [see this *Bulletin*, 1938, No. 4, p. 78 and 1940, No. 6, pp. 121-122]. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Januar 1942, 22. Jahrg., Nr. 1, S. 5).

Germany (Protectorate of Bohemia and Moravia). — Decree No. 461 dated November 20, 1941 modifies slightly the Decree of December 5, 1940 [see this *Bulletin*, 1941, Nos. 7-8, p. 142] relative to the supervision of and trade in products intended for the protection of plants and plant products against noxious pests. (*Sammlung der Gesetze und Verordnungen des Protektorates Böhmen und Mähren*, Prag, Dezember 1941, 168. Stück, S. 2081-2082).

United States of America. — It has been found as a result of additional experiments with treatments for freeing nursery stock and potted plants from the immature stages of the Japanese beetle [*Popillia japonica*] that the methyl bromide fumigation treatments may be further modified. Accordingly the administrative instructions to inspectors on the treatment of nursery products, fruits, vegetables, and soil, for the Japanese beetle, modified on August 6, 1941, provide for a temperature of 67° F. instead of 70° as heretofore, for the 2 ½-hour treatment with a 2-pound dosage; and for 73° under a 2 ½-hour treatment with a 1 ½-pound dosage. The diameter of the soil balls in all treatments is placed at a maximum of 14 inches instead of 12 inches as heretofore. (*Federal Register*, Washington, August 14, 1941, Vol. 6, No. 158, pp. [4055]-4056).

France. — A Law of November 28, 1940 prescribes the declaration of copper sulphate stocks. (*Bulletin de Renseignements agricoles*, Paris, 1er décembre 1940, année 1940, n° 22, p. 436).

⁂ A Law dated January 3, 1941 modifies and supplements the Law of November 28, 1940 relative to the declaration of copper sulphate stocks. (*Ibid.*, 15 janvier 1941, année 1941, n° 2, p. 40).

⁂ A Decree of March 25, 1941 establishes the statute of the officers of the Plant Protection Service. (*Ibid.*, 1er avril 1941, n° 7, p. 236-237).

⁂ Another Decree of the same date establishes the scale of pay and expenses of the officers of the aforesaid Service (*Ibid.*, p. 237).

Switzerland. — Ordinance No. 2 of the Federal Department of Public Economy dated December 18, 1941 disposes as follows:

The products employed in the control of crop and food pests, and for weed destruction, in so far as they regard agriculture and allied branches, cannot be manufactured or sold without the authorization of the Federal Stations for experiments and agricultural analyses. A special authorization is required for each product.

The sales authorization is required for all the products an establishment manufactures, as also for those the said establishment sells or puts up for sale, including products of foreign origin. The products of Swiss origin already au-

thorized may be resold without a special permit, provided that they are delivered in the original packing and that the retail dealer changes neither the name, nor the composition nor the instructions regarding method of use.

New products and all those which have not been checked cannot be put on the market until the competent Station has subjected them to biological and chemical tests and also, if necessary, to a large scale practical test. The Station may dispense with the biological test if from a physico-chemical examination it is found that the product is utilizable. With a view to accelerating the checking of new products and assuring the results several Stations may undertake simultaneously the tests considered indispensable. In some cases, the biological checking of new products to be tested on a large scale may be executed by the Station according to a plan agreed upon in advance between the said Station and the manufacturer.

Each authorized product is given a check number.

It is prohibited to change in any way whatsoever the designation or chemical or physical composition of a product without the authorization of the Station for control.

The use of products, the manufacture and sale of which are authorized may only be recommended for the control of the parasites, diseases or weeds endorsed by the permit. This authorization may be supplemented if it is proved that the products cover a wider use.

In granting the permit the Stations do not in any way undertake to assure the supplying of raw materials to the manufacturer, nor the sale of the finished product.

The authorized establishments will forward each year before Jannary 15 to the competent Station, on a special form, a complete list of the parasiticides and weedicides which are endorsed by permits for manufacture and selling. The forms will be furnished by the control Stations.

The Federal Stations publish each year in the agricultural press a list of the authorized products, giving the name of the manufacturer or important, active principles and dosage. If the prices are printed, the publication will give any changes which may be made during the course of the year.

Only those products complying with the regulations of the ' Manuel des matières auxiliaires de l'agriculture ' may be placed on the market.

With a view to assuring a rational and economic use of raw materials, the Federal Stations for experiments and agricultural analyses are authorized to make arrangements with the manufacturers as regards the minimum content of the principal active substances.

The check number should always be stamped on the packing. Packing, labels, handbills, etc. referring to the substances employed in the control of plant pests (insecticides, fungicides, weedicides) must carry, besides decorative labelling, the regular name of the product in clear, readable letters, sufficiently large in size.

The nature of the active substances contained in each product and method of use should be indicated on the packing, handbills, advertisements etc. according to the regulations established by the ' Manuel des matières auxiliaires de

l'agriculture'. Poisonous products must be indicated by a caput mortuum of proper size on the packing, handbills, etc. The content of poisonous substances should be given in percentage, conformably to the prescriptions of the Manual.

The sale and use of toxic products are governed by cantonal prescriptions. To prevent waste, indication will be clearly given, by volume or by weight, of the minimum doses of each product to be employed.

The agencies of the Stations or their agents are authorized to take from manufacturers, as also in the sales depots, premises, branches, etc. of the establishments which trade in the products employed for the control of crop and food pests, samples of the substances which are stored or placed on sale, and to verify or cause to be verified whether the prescriptions of this Ordinance are observed.

The cantons are required to place the police at the disposal of the checkers.

The control Stations may at any time demand from manufacturers, sellers and buyers of products subject to control to forward them samples for analysis. The Stations will refund the transport expenses to the manufacturer. They will reimburse these expenses and the value of the sample to middlemen and buyers.

If the purchase value of one product is as much as or over 200 francs, the buyer is entitled to have from the seller, for each delivery, a certificate giving him the right to an analysis of the product. The buyer who has received this certificate may request the control Station, on the payment of a small office fee, to verify whether the content of the product in active substances corresponds to the requirements of the 'Manuel des matières auxillaires de l'agriculture'.

This measure does not apply to raw materials intended for the manufacture of products or those purchased for reselling.

The reprinting of analytical reports or their use for advertising purposes is prohibited (*Recueil des lois fédérales*, Berne, 8 janvier 1942, nº. 1, p. 1-11).

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[For the first four parts of this VIth volume, see this *Bulletin*, 1939, No. 3, p. 58 and 1940, No. 1, p. 12.

This fifth and final part of the volume contains, besides the sequel and continuation of the fourth part (IV. Resistenz gegen tierische Parasiten und Schädlinge) of the fifth chapter (Fünfter Abschnitt: Anbau und Züchtung krankheitsresistenter Sorten von E. Köhler, S. 401-406), the following chapters:—

Sechster Abschnitt: Die Pflanzenschutzgesetzgebung.

I. Die gesetzliche Regelung des Pflanzenschutzes in Deutschland von S. Wilke (S. [407]-463).
II. Die gesetzliche Regelung des Pflanzenschutzes in ausserdeutschen Ländern von H. Braun (S. 463-583).
Siebenter Abschnitt: Die Pflanzenschutzorganisationen von Otto Appel und Hermann Voelkel (S. [584]-632, Abb. 183-184).
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[This manual which originally should have been the second edition, translated into English, of the book on the nematode parasites of plants, published in 1934 in Russian by I. N. Filipjev, was, after the death of this writer, completed and finished by J. H. Schuurmans Stekhoven Jr. assisted by S. Frechkob. The important additions of the second author successively introduced into the original text of Filipjev were such that the result was an entirely new book.
It consists of five parts together with an appendix. The first part treats on the general morphology and the biology of nematodes; the second deals with systematics; in the third the technical methods for the collection and preparation of the nematodes are explained; in the fourth, which is the most extensive, a detailed description is given of the very numerous species of these worms which parasitize plants; finally in the fifth, the nematodes which are parasites of insects are reviewed. The appendix covers the *Gordiaceae* or *Nematomorpha*, interesting group of parasites which have been considered as being very similar to nematodes, although they have no connection with these and should be included in the *Vermes polymera*. A most comprehensive, up to date bibliography concludes each section of this book].

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[In literature there was no real, proper practical handbook which could enable collectors and growers of officinal plants and also warehousemen of the drugs obtained, to recognize the plant and animal parasites which attack these plants and their products and which could indicate the means of preventing or at least attenuating the damage when it is a matter of cultivating the plants or conserving the parts used particularly in pharmacy or perfumery.
The repertory of the plant and animal parasites which damage officinal, aromatic and perfume-yielding plants, wild or cultivated, and stored officinal drugs, was in fact elaborated by an expert on the subject, Prof. A. Nannizzi, Director of the Botanical Institute of the University of Siena, with a view to meeting this need. This important volume is divided into three extensive sections and an appendix. The first part deals with the plant and animal parasites of officinal and aromatic plants growing in the wild state. All the necessary indications are given to facilitate the finding and identification of these plants.
The second part treats on the plant and animal parasites of the officinal, aromatic and perfume-yielding plants which are cultivated. Following the brief description of each plant and the general rules for its cultivation, details are given on the respective parasites and on the control methods most suitable from the practical standpoint.
In the third part, the plant and animal parasites of stored drugs are described. The appendix covers the plant and animal parasites which usually infest drug warehouses, laboratories and pharmacy stocks as well as those which attack different pharmaceutical substances and preparations.
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[A Commission nominated by the request of the Netherlands Association for plant diseases and composed of Messrs H. A. Diddens, T. A. C. Schoevers

and Miss H. L. G. de Bruyn has compiled this list of the Dutch names of the diseases produced by bacteria, fungi, virus or caused by unfavourable soil conditions on the following plants: *Triticum, Secale, Avena, Hordeum*, meadow grasses, *Zea mays, Polygonum fagopyrum, Linum, Beta vulgaris, Solanum tuberosum, Daucus carota, Vicia faba, Phaseolus vulgaris, Pisum, Trifolium, Medicago, Vicia, Lupinus, Carum carvi, Brassica, Papaver, Allium cepa, Spergula arvensis*. The intention of the Commission is that the names given in the list should be taken as official].

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Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

THE NETHERLANDS.

The Colorado Beetle (*Leptinotarsa decemlineata*) in 1941 †

In the Netherlands, the Colorado beetle situation in 1941 was about the same as in 1940. It was only to the south of the Meuse (exception being made for two foci north of the Rhine) that the insect was reported in 59 communes (in 1940, 119) of which 51 (in 1940, 44) may be considered as foci. In comparison with the year 1938 when the respective figures were 161, 607 and 224, the situation is very favourable.

Control operations were carried out as in the previous years, that is, trap plants on the foci of the preceding year and careful watch maintained for over two months; intensive control of potato fields and three sprayings with a 0.4 per cent. solution of calcium arsenate in the region south of the Rhine; complete eradication in all districts where the Colorado beetle has been reported.

The efficacy of the eradication of foci the previous year by the control measures applied is proved by the fact that only in two foci, 1 and 4 insects respectively were captured on the trap plants.

Spraying was effected during the following periods: June 30-July 8, July 17-26 and August 1-9. The quantity of calcium arsenate placed at the disposal of the farmers amounted to 491,000 kg. Spraying was supervised by 122 inspectors. Expenses totalled approximately 231,000 florins.

The Colorado beetle was first observed on June 9; the first oviposition took place on June 21 and the last on August 14. The first generation made its appearance on August 6 and 9; no second generation was reported.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Comunication from the Phytopathological Service of the Netherlands, Wageningen, official correspondent of the Institute.

VARIOUS QUESTIONS

The Mineral Intake and the Resistance of Plants to Microbial Diseases (*continued*) *

The mineral elements participating in the physiological functions of the plant in the state of organomineral compounds.

The chlorosis produced by a deficiency in mineral elements disappears automatically if the element which is wanting is intriduced into the nutrient solution. This mode of treatment, alaways effective, is not original and teaches us nothing new. A more direct and instructive method consists in bringing the remedy into contact with the cells which, by their aspect, show deficiency symptoms.

Proceeding thus, it is known that the soluble compounds of iron and sulphur in solution at 10^{-4} or 2×10^{-4} applied with a dropper to leaves rendered chlorotic through iron or sulphur deficiency, turns the parenchyma green after a day's exposure to the sun. When dilute solutions are employed, the green patch does not exceed the limits of the drop; the cells which have fixed the iron or sulphur do not cede them to the neighbouring cells. The elements, therefore, are retained by the protoplasm which utilizes them in the chemical transformations of photosynthesis, as they cause the chlorophyll to appear although they do not enter into its composition.

This is not the case when the plant is subjected to a deficiency in Mn, Zn, Bo, etc. Weak solutions of their mineral compounds placed in drops on etitolated leaves do not cause any formation of chlorophyll on exposure to the sun. The discoloured cells, therefore, cannot assimilate them in the state of mineral compounds, as on absorbing them, they do not resume their physiological activity. This does not mean to say that their direct assimilation is not possible by cells less severely affected by the deficiency in question; it is the contrary which is true: spraying with a solution of the wanting element carried out in time prevents the discoloration of the leaves and the death of the plant. This is of considerable practical importance; it is the following, however, which is very instructive.

If on the discoloured leaves is placed a drop of exudate (nocturnal sudation) or of the cellular sap taken from a normal plant, the green colour appears after a day in the sun.

The patch goes beyond the limits of the drop of liquid and spreads first in the direction of the ascending sap up to the tip of the leaf, then in the other direction towards the base. The intensity of the reaction depends on the stage of chlorosis; it is less striking when very badly discoloured leaves are tried.

* Note of Prof. PIERRE MAZÉ, Pasteur Institute, Paris, France.

The cellular sap and the exudate contributed the wanting elements in a directly assimilable state which is the organomineral state, the mineral salts having no effect.

It follows that a mineral deficiency of any sort places the plant or more generally the living cell, in the impossibility of elaborating the organic support by which it stimulates and regulates the biochemical properties of the mineral elements.

Another fact should be mentioned: this is the specificity of this reaction: the exudate or cellular sap of other gramineous species have no effect on chloroses produced by mineral deficiencies other than those due to want of iron or sulphur. This specificity is worth studying; it would be easily explainable if there were proteins, but the organominerals in question are not proteins as they can be heated beyond 100°C. without being rendered inactive; it is justifiable, therefore, to admit that it is a case of a mixture of compounds, each of which taken separately is incapable of ensuring the resultant effect. One of the associated compounds would contain the missing element. The deficiency of a mineral element may, in fact, cause disturbances which are not limited to the disappearance of the one organic compound which serves as support; it is probable that the chemical capacity of a cell lacking in an element is attained on many points when chlorosis is perceptible. These are the different deficiencies which normal cell sap alone, acting as a blood transfusion, can cause to disappear simultaneously. Furthermore, examples of these reactions by impulse are not lacking. Deficiency in iron or sulphur leads to the complete disappearance of the chlorophyll and even of carotene, if the sunlight is very strong and the temperature very high. Chlorophyll, however, does not contain iron nor sulphur; if it disappears, it is due to another phenomenon which I consider as a reaction of protection against an excessive rise in temperature in the isolated cells incapable of utilizing the solar energy collected by the green and yellow pigments.

The organomineral compounds considered above disappear in normal plants in the course of a series of wet and cold days.

In reproducing under different conditions the experiments which I have just recalled, facts stand out which at first sight may seem surprising: the cellular sap and the exudate of leaves lose, after a series of cold and rainy days, the property of causing the parenchyma, discoloured through mineral deficiency to turn green again.

The organomineral substances considered here, therefore, are utilized by the plant as temporary reserves and disappear completely when atmospheric conditions more or less check the photosynthetic activity of the leaves.

In this state of physiological poverty, the cell loses some of its properties; it recuperates them, as can easily be verified, after a few days of fine weather. It may be noted, by the way, that the influence of bad weather, the mechanism of which we have just considered experimentally, prepares the way for microbial infections; there will be frequent occasion to recall this preliminary remark.

Other properties of normal cellular sap. Resistance of plants to microbial infections.

The treatment of the effects of experimental intoxication due to the heavy metals Pb, Ag, Hg, etc. with the cellular sap of normal leaves causes etiolated leaves to again turn green after a day or two of exposure to the sun; the procedure is identical with that followed in the treatment of mineral deficiencies.

It was also from the external aspect of an intense chlorosis that I discovered two unexpected cryptogamic infections which occurred during the course of my studies on mineral intake.

In a tank of maize which should have grown normally, suddenly one plant showed abnormal chlorosis. This was due to accidental contamination of the plant by a colony of *Aspergillus niger*; it had developed on the surface of the solution and surrounded the stem below the first node. The mycelium having succeeded in penetrating the vascular bundles, appropriated for its own use all the iron absorbed by the roots, as the chlorosis in this case was due to want of iron.

The disease appeared during a period of rainy days; when fine weather returned, the chlorosis disappeared quicker than when it occurred. The same incident was observed two years later under the same conditions and with the same result. The causes and effects being thus reproduced identically, their temporary interpretation, after what we know, is easy.

A habitual saprophyte has become an occasional parasite because it takes advantage of the want of resistance of the plant due to adverse weather; it is easily eliminated with the return of fine weather as the plant has elaborated anti-microbial substances with which it was temporarily deprived; the sap having brought these substances into contact with the parasite, the latter was rapidly placed in the position of being unable to exist.

Thus we now have two series of experimental diseases: disorders due to mineral deficiency and microbial diseases. That these have arisen contemporaneously is just chance, but a relative chance as both recover by the same curative methods: the properties of normal cellular sap.

It only remains to submit the proposed interpretations to practical proof. *

Development of maize smut (*Ustilago maydis*).

The occasion arose about 1927. The field utilized for producing the seeds required in my experimental investigations had not had any organic fertilizer since 1900. Formerly grown to truck crops, the soil is sand from the valley of the Seine supplemented with limestone and very rich in humus.

* The facts which are now going to be summarized appeared in the *Comptes rendus des séances de la Société de Biologie* (Paris) from 1927 to 1941 in the from of brief notes; a provisional summing up on the subject of the present note had already been published in the same reports in 1916 (t. 79, p. 1059).

Towards 1920, only maize was grown. The size of the plot is only 19 m^2 and the number of maize plants carried after two successive thinings out, first fixed at 36, after a few weeks only amounts to 24. This figure is not large, but is sufficient to follow attentively the development of each plant. This is an advantage which is not to be overlooked.

The fertility of the soil, since 1900, was maintained by mineral fertilizer (ordinary commercial salts) comprising five mineral elements N, P, K, Mg, S; the others, including calcium, being present to a sufficient degree in the soil. This treatment met the purpose which was the production of maize ears to supply the seed utilized in my experiments with aseptic solutions.

About 1920, smut appeared on my plants introduced by commercial seed which I was obliged to purchase some years before. It spread to all the maize plants without any attempt being made to check its development, because it occurred at the proper time for close observation.

The first years were employed in following its development, establishing the means of ascertaining its presence in the tissues of the plant by cultures on solid media and disclosing the influence of atmospheric conditions on its development.

This advance work being accomplished, the field was divided into two plots of equal area; the one was given a complete nutrient solution, the other, the solution composed of the five elements indicated above. It was justifiable to suppose in fact, that the soil was deficient in the elements utilized by the plant in minimum doses, after 30 years continued cultivation to maize.

Moreover, the dwarf bean which was cultivated with the maize as an intercalary crop, from the first years of study expressed this deficiency by a disease of the stalk, disease due to various fungi, with a *Botrytis* and a *Verticillium* predominating, associated with bacteria.

The nutrient salts employed in the form of solutions double the concentration of that indicated earlier on, were given in four applications: the first before ploughing, the second after ploughing, three or four days before sowing, the third at the onset of flowering, the fourth after fecundation, in all corresponding to 400 kg. of sodium nitrate per hectare and the remainder in the proportions indicated in the table given on p. 21 of the February issue of this *Bulletin*.

From the early years an appreciable advantage was obtained in the plot which received the complete solution; this advantage, however, was gradually reduced because the salts employed supplied the soil, in the form of impurities, that which was deficient. The same supply naturally also existed before the appearance of smut, but the mineral fertilizers were much more reduced.

Another result, no less interesting, with this method of fertilizer application is the marked earliness of the plant. Sown about May 15 each year, the maize arrived at maturity before the end of September, 15 days to three weeks before the crops in the maize regions (Savoy, Dauphiny and Languedoc).

As the question stands at present, the following conclusions may be drawn:

In a heavily contaminated soil where the smut spores are maintained by annual crops of maize, infection of the seedlings occurs during germination; the parasite is localized in the first node of the stem and attains all the parts of the plant assembled together in the embryonic state.

If germination takes place rapidly owing to favourable weather which continues throughout the season, the effects of the disease pass unnoticed; all that can be remarked is that the adult leaves of the plant the most affected by the first infection, show a sort of mosaic formed of circles more discoloured in the centre, 1 to 5 mm. in diameter, spots more or less numerous according to the seriousness of infection. These spots are not specific, any common microbe may accidentally give the same symptoms; if there are good grounds for attributing them to *Ustilago*, it is because they can develop into small tumours when atmospheric conditions are unfavourable to the plant.

When germination coincides with unfavourable atmospheric conditions, infection is much more severe; the tendency to branching from the first node of the stem, the appearance of parchment-like spots on the first leaves, the partial congealing of the parenchyma and sometimes the formation of small swellings on the sheaths are the revealing symptoms, but not all are specific. The seedlings which show these symptoms are removed on thinning out and serve for control tests on solid nutrient media. Those which appear normal are retained; they may also, at first, be considered as contaminated. The return of normal weather conditions, I repeat, checks the development of the fungus and, if these conditions continue, the plant grows without difficulty.

If a period of unpropitious days occurs, the parasite develops insidiously; it takes advantage of the receptive state of the plant to establish foci of pullulation which the return of warm and sunny days suddenly makes evident; the smutty swellings become apparent; it is at the flowering season, when the plant has attained its full development, that they acquire a considerable size. The sap as yet containing no antimicrobial substances, feeds the fungus instead of checking its development. By its suddenness and rapidity, its development may be compared to the springing up of mushrooms in the woods after a heavy downpour. From day to day, the dormant buds come to life in the axils of the leaves and may attain within a few days, the size of a fist. The male inflorescences sometimes bear axes of female flowers alternating with axes of male flowers, both being more or less smutty.

If it is recalled that many cryptogamic diseases of annual or perennial plants present this 'explosive' development under the influence of the same weather conditions, the following basic conclusion may be drawn:

Microbial diseases are occasional diseases which favour a receptive state of the plant caused by atmospheric conditions, the mode of action of which on the physiological properties of the cellular sap I have indicated.

An interesting deduction results from this conclusion: it is imagined that the sole means the plant has to check the development of the parasite is the rapid production of antimicrobial substances which have disappeared from the sap, in other words, it is a very considerable photosynthetic activity. It is the high yielding variety, therefore, which primarily is the most resistant ot microbial infection.

The resistance to cryptogamic diseases factor has always attracted the attention of plant breeders who have created hybrids of *Vitis vinifera* which are resistant to mildew but which, at the same time, are high yielders.

These resistant hybrids are not refractory to mildew and the manner which the mildew develops on the leaf is very suggestive. The colonies of the parasite are limited to the smallest islets of the parenchyma formed by the finest ramifications of the nervures. During very wet summers when copper sulphate appears to lose all effect on the development of the fungus, the spots multiply and form a veritable mosaic; the leaf does not wither however; it continues its work of photosynthesis, and the bunches remain intact. It is not unusual to see, after a very rainy summer, hybrids bearing a full crop besides non-resistant plants having neither leaves nor fruit.

Resistant hybrids possess the property of elaborating rapidly antimicrobial substances; ordinary thinning out is enough for them to recuperate an adequate immunity, so well that the mycelium of the parasite which manages to penetrate into the parenchyma cannot cross the small vascular bundles in which the antimicrobial compounds circulate. The development of the disease is quite different, as is known, in non-resistant varieties. The spot produced by only one germ may spread over a large part of the leaf; two or three colonies destroy it.

Thus, in the same vineyard, the clearest possible demonstration is given of the apparent mechanism of the protective reactions which are produced in the cell under the influence of solar radiation.

(*To be continued*).

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — A Ministerial Circular of November 4, 1941, relative to the use of hydrocyanic acid gas combines in a single text, with a view to standardizing practical application, the provisions of the Ordinances dated March 25, 1931, November 29, 1932 and May 6, 1936 [see this *Bulletin*, 1936, No. 8, p. 173] regarding the use of violent poisons in pest control. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 3-15).

*** A Circular dated November 6, 1941, extends to Ostmark and to the Sudeten district the provisions of the Circular of January 28, 1938 [see this *Bulletin*, 1938, No. 7, pp. 147-148] relative to the destruction of barberry [*Berberis vulgaris*]. (*Ibid.*, S. 2).

*** An Ordinance of November 14, 1941 regulates the fees to be collected in regard to the official supervision of nurseries as established by the Decree of November 21, 1939 [see this *Bulletin*, 1940, No. 5, p. 103] relative to the control of the San José scale [*Aspidiotus perniciosus*]. (*Ibid.*, S. 2-3).

Germany (Alsace). — Ordinance of October 14, 1941 prohibits the establishment of vineyards in districts other than those designated as wine-growing districts by the competent authority.

The Ordinance also gives a list of the vine varieties which, from the year 1943, will be authorized for cultivation. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 18).

Germany (Protectorate of Bohemia and Moravia). — The Ministerial Notification No. 1023 of September 2, 1941 comprises a list of chemical preparations and indicates the conditions to which they must comply as regards their content in active elements and their external form and presentation.

It is a question of ' simple substances ' as considered by the Decree of December 5, 1940 containing new provisions relative to the control of and trade in the preparations intended for the protection of plants and plant products against noxious pests [see this *Bulletin*, 1941, Nos. 7-8, p. 142]. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 21-25).

⁂ Ministerial Notification No. 233 (Chem. 39), dated January 6, 1942, makes the sale of copper sulphate for use in the control of pests of fruit and vine crops, of hops, potatoes and beets, subject to the presentation of a purchase permit (' Bezugschein '). The said Notification contains detailed provisions regulating the obtaining and operation of the permit in question. (*Ibid.*, S. 26-27).

Germany (Western Prussia - Dantzig District). — By Ordinance dated December 18, 1941, the control of suckers, scale insects and other pests of fruit crops is made compulsory. The owners and usufructuaries are required during the winter to treat all fruit trees and shrubs with carbolineum or some other means of control recognized as being effective by the central Plant Protection Service. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 17).

Germany (Government General). — A Decree of July 21, 1941 establishes the modalities to be fulfilled by those desiring to take up work regarding the control of parasites and exercise the calling of control operator. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 19-20).

Chile. — Decree No. 438, dated July 9, 1941, substitutes Decree No. 346 of April 10, 1940 [see this *Bulletin*, 1941, No. 1, p. 8] establishing the rate to be charged for crop disinfection work on the farms. (*Diario Oficial de la República de Chile*, Santiago, 25 de septiembre de 1941, año LXIV, núm. 19.069, págs. 3006 a 3008).

Colombia. — Decree No. 560 of March 24, 1941 establishes the measures to be adopted, with a view to the sanitary protection of potato cultivation in the Departments of Caldas and Tolima, against the ' gusano blanco perforador de la papa ' (*Trypopremnon* sp.). (*Diario Oficial*, Bogotá, 31 de marzo de 1941, año LXXVI, núm. 24625, pág. 1122).

Denmark. — Decree No. 504 of December 9, 1941 modifies the Decree No. 45 of February 28, 1931 relative to the toxic substances employed in the control of plant diseases. (*Lovtidenden A.*, København, 20. December 1941, Nr. 76, sid. 1549).

Morocco (French Zone). — The Vizirial Decree dated December 12, 1941 (23 kaada 1360), supplementing the Vizirial Decree of May 17, 1933 (22 moharrem 1352) [see this *Bulletin*, 1933, No. 9, p. 207] fixing the rate of the fee for cost of sanitary inspection for the import into French Zone of Morocco of plants, parts of plants or plant products, establishes that exemption is made in the case of plant products originating in the French Zone which, dispatched to France, are returned to Morocco because not accepted for shipment at an Algerian port. (*Bulletin Officiel*, Rabat, 9 janvier 1942, XXXI[e] année, n° 1524, p. 25-26).

⁂ The Vizirial Decree of December 31, 1941 (12 hija 1360) modifies the Vizirial Decree of August 1, 1936 (12 joumada I 1355) [see this *Bulletin*, 1936, No. 10, p. 227] relative to the application of sanitary measures to potatoes, tomatoes and eggplants on their entry into the French Zone of the Sherifian Empire.

It establishes, *inter alia*, that consignments of tomatoes, eggplants or potatoes intended for the French Zone of the Sherifian Empire or passing through the said zone, may only be allowed if packed in new packing material. As a temporary measure, for the duration of hostilities the Plant Protection Board may authorize the importation of these plant products in second-hand packs, if it is considered that such importation may be made without any danger. The said Board may, in this case, prescribe any sanitary measure considered advisable, such as the re-packing of the consignment at the Moroccan port or frontier station where imported. (*Ibid.*, 30 janvier 1942, n° 1527, p. 84-85).

⁂ A Decree of January 3, 1942 authorizes the destruction of boars which are causing serious damage in the crop lands in the Rabat region. (*Ibid.*, 23 janvier 1942, n° 1526, p. 68-69).

Peru. — A Resolution of August 8, 1941 suspends the application of the Resolution of July 19, 1941 [see this *Bulletin*, 1942, No. 1, p. 4] regarding the control of the ' pasmo ' disease of flax [*Sphaerella linorum*] and authorizes the trade in and utilization of the linseed harvested in the Department of Cajamarca provided that the seed is previously disinfected under the supervision of officers of the Division of Agriculture and Animal Husbandry.

Any small sowings which may have been made with seed obtained from the aforesaid Department and not previously disinfected must be destroyed by the growers themselves who, if this operation is carried out without delay, will be indemnified by the Division of Agriculture and Animal Husbandry. (*La Vida Agrícola*, Lima-Perú, septiembre 1941, vol. XVIII, núm. 214, págs. [731] a 733).

Portugal. — ' Portaria ' No. 9.961 of December 16, 1941 makes compulsory the control of pear scab (*Fusicladium pirinum*), the codling moth (*Laspeyresia [Cydia] pomonella*), peach leaf curl (*Exoascus [Taphrina] deformans*) and other diseases or pests prevailing in pomaceous and drupaceous orchards in the parishes of Colares and S. Martinho, municipality of Sintra. (*Diário do Govêrno*, Lisboa, 16 de dezembro de 1941, I série, núm. 292, pág. 1349).

⁂ ' Portaria ' No. 9:970 of December 22, 1941 declares compulsory the control of pear scab (*Fusicladium pirinum*), pear sawfly (*Hoplocampa brevis*), the codling moth (*Laspeyresia [Cydia] pomonella*), peach leaf curl (*Exoascus [Taphrina] deformans*) and other diseases or pests prevalent in pomaceous and drupaceous orchards in the parishes of Azueira and Sobral, municipality of Mafra. (*Ibid.*, 22 de dezembro de 1941, núm. 297, pág. 1384).

Sweden. — Royal Decree No. 749 of September 19, 1941 modifies Article 2 of the Royal Decree No. 50 dated March 6, 1936 regarding the importation of plants and parts of plants. (*Svensk författningssamling*, Stockholm den 19 september 1941, nr 748 och 749, sid. 1546).

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DISCOVERIES AND CURRENT EVENTS *

LIBYA.

Association between the Larvae of the Diptera *Ceratitis capitata* and *Lonchaea splendida* †

The living together of larvae of Trypetidae with those of Lonchaeidae has long been observed over and over again in the different parts of the world and also in Tripolitania. I have already had occasion to cite the case of the association of the larvae of *Ceratitis capitata* Wied. with those of *Lonchaea splendida* Loew. in a work which constitutes a preliminary note to a more detailed study completed later on and which will form the subject of another publication.

For the present I will only give a general outline of the observations made over a period of five years, establishing the relations which exist between the two diptera in the western part of Libya.

C. capitata, after having effected the first annual generations at the expense of different fruits (citrus, apricots, peaches, etc.), passes, from July, onto chillies, the pods of which can be pierced at practically any stage of their development, when at the size of a hazelnut up to full maturity; the varieties susceptible to attack are nearly all those cultivated in the zone where investigations were carried out (Provinces of Tripoli and Misurata) and included both those with mild fruits and those with pungent fruits, the latter being habitually used by the local population as a the customary seasoning of the different foods.

It may seem peculiar that *C. capitata* attacks this solanaceous plant in Libya while this is not the case in the Mediterranean regions which, as regards climatic conditions, greatly resemble the Italian colony. It is to be presumed that the causes should be sought for in the different floristic conditions and chiefly in the fact that in the zones of Tripoli and Misurata, during the summer months, there is practically no fruit to be attacked. In fact, after the ripening and harvesting of the Indian figs, which is effected in July, there is almost no other fruit until the persimmons mature, which is in September. In the interval, which is nearly three months, *C. capitata* turns to capsicum fruits.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Communication from Dr. Giuseppe M. Martelli, Assistant Director of the Agricultural and Zootechnical Experiment Centre of Libya, Chief of the Section of Agricultural Entomology and Zoology, Tripoli, Libya.

The number of larvae found in each chilli pod varies fairly considerably and depends both on the season and on the ovipositions which take place in the same pod. I was able to count a minimum of 6 up to a maximum of 153 larvae in the height of summer, with a general average of about 30 larvae; towards the end of summer and in autumn, on the contrary, the highest number found were 19.

Immediately after the attack of *C. capitata,* that much more serious of *L. splendida* takes place, the eggs being deposited in the openings made by the larvae of the first dipter or even in the punctures. The number of larvae of *Lonchaea* is much higher than that of *Ceratitis*, running to several hundred; thus I counted in one sole pod, a minimum of 39 up to a maximum of 737 larvae of *L. splendida*. This dipter causes greater damage than *C. capitata,* owing to both the greater number of larvae in the same pod and to the presence of one or several symbiotic bacteria of these larvae.

Consequently, while the chilli pods infested by *C. capitata* only, could still be partly utilized for ordinary kitchen use after removing the spoiled parts, when attacked by *L. splendida* they very rapidly lose their edible properties as the entire pulp within a short time turns into a decomposed and malodorous mass.

L. splendida damages not only chillies but also other horticultural species: citrus fruits and peaches already attacked by *C. capitata* and even potato tubers attacked by the potato moth (*Phthorimaea operculella* Zell.). Infestation by *L. splendida,* however, does not necessarily follow that of other insects, as even on chillies free from entomological manifestations and only injured, in rare instances I have found larvae. Without any doubt, as I was able to establish experimentally, *L. splendida* cannot attack perfectly sound fruits or vegetables.

In view of these prerogatives, *L. splendida* has essentially saprophytic characteristics although some manifestations of hemiparasitism cannot be entirely overlooked.

As the damage caused by these two diptera are appreciably greater than the total of the damage taken separately, the association of the larvae of the two species gives rise to an action of synergy; and since taking part in causing the damage, besides the two larvae, are also the symbiotic bacterium of *C. capitata* (*Escherichia ellingeri*), studied by Ciferri, and at least one probably common, putrifying bacterium, the synergy should be considered as multiple.

The conclusions at which I arrived at the end of my experimental investigations are the following:—

(1) *C. capitata* attacks sound chillies of all the varieties cultivated in Libya.

(2) *L. splendida* does not attack sound capsicums, but only those which have already been attacked by *C. capitata* or which have been damaged in some other way.

(3) The ordinary symbiotic coccobacillus of *C. capitata* is not necessary for *L. splendida.*

(4) It has not yet been possible to isolate specific symbiotic bacteria of *L. splendida* and, in the present state, if symbiosis is admitted, it must also be admitted in the case of ordinary putrefaction bacteria.

(5) From the biological viewpoint, *L. splendida* is a parasite of chillies while economically it is manifested as a saprophyte or more precisely as a hemi-parasite.

(6) The association of the larvae of the two diptera and the corresponding bacteria is a multiple synergy.

VARIOUS QUESTIONS

The Mineral Intake and the Resistance of Plants to Microbial Diseases (*concluded*) *

Maize cultivated in a complete mineral solution and protected from microbes, is resistant to microbial diseases.

The inoculation of smut in the form of spores or 'yeast forms' taken from pure cultures, into maize plants grown in a complete and aseptic mineral solution always gave negative results in my experiments; more exactly, no apparent symptom revealed the presence of the fungus in the plant.

The same relative failure may be noted each time the stalks of maize plants cultivated in the open are inoculated, inoculation being carried out when the weather was fine; and yet spontaneous infection by dry spores dispersed by the wind is sometimes followed by a rapid general spread of the disease. This occurs when contamination coincides with the development of the ears and when the evolution of the disease is favoured through wet weather. After a few days incubation and the return of fine weather, the entire terminal part af the ear becomes hypertrophied and projects out of the sheath, clearly showing the seed transformed into black swellings the size of a hazelnut or small prune.

This infection of the female flowers by the stigmata is frequent under ordinary conditions of cultivation, but rarely has much effect. That infection has occurred is seen from the presence of one or several smutty seed at the tip of the ear; the seed, however, has to be broken to see if infection has taken place as, taken as a whole, the ear does not appear abnormal in any way.

All these so varied aspects of smut development have long been known; they are attributed to a variation in the virulence of the infecting agent; nothing of the kind, it is the degree of resistance of the plant which regulates all these different phases of the development of the parasite. This latter is always in wait for a physiological depression of the plant and takes full advantage when this occurs.

The fact which now interests us is that the occasion thus defined arises more frequently in certain soils. It may be noted that the plants cultivated in a

* Note of Prof. PIERRE MAZÉ, Pasteur Institute, Paris, France.

complete and aseptic mineral solution possessed a sufficient immunity because they are supplied regularly with nutrients, a condition which my experiment plot does not fulfil to the same extent. It is not impossible, however, to find ground where the conditions of vegetation come closer to those obtained with a complete solution. This is precisely the case of the sewaged land of Paris.

After 30 successive years of forage maize crops on a field of about 12 hectares, smut had passed unnoticed; the overseer, however, had observed some suspected swellings, but he was unaware of their signification or origin; this is to say that smut did not cause any appreciable damage to the crop. These swellings appeared each year on some maize plants growing round about the sewage outlet.

A thick layer of black mud covered the ground for a radius of several metres and it was only in this area that I observed the presence of the disease with its various symptoms, impressive in size and form. If contamination remains so restricted despite the enormous quantity of spores which can be dispersed, it is because the plant is in a condition to check the development of the *Ustilago*. Owing to the variety and high content of mineral and organomineral elements, therefore, sewage has a more marked influence than the exclusive mineral fertilizers. Here, however, it is rather the nature of the environment which is concerned. Of the same origin and having fairly similar physical properties, the two soils differ by the humus which they contain, superoxidized and leached in my experiment field, rich and constantly renewed in the sewaged land.

The influence of mineral nutrition on the resistance of maize to microbial diseases may now be briefly summed up:—

(1) Complete and aseptic mineral solutions make maize resistant to smut.

(2) The sand of sewaged land posseses the same property when it is abundantly fertilized with mineral fertilizers.

(3) The sand containing superoxidized humus which has not received organic fertilizers for over 30 years only has to a lesser degree the power of maintaining the resistance of the plant to injury by *Ustilago maydis*.

The resistance conferred on the plant by the complete mineral solution applies to all microbes.

It is justifiable to attribute these results to the relative facility with which the plant obtains in these three mediums the elements it requires, the recuperation of the state of resistance being, as seen above, a question of rapidity in elaborating the antimicrobial substances.

It should be noted, however, that so far it is only a question of one parasite of maize; consequently, there is nothing to prove that the conclusions stated can be generalized. The study of the disease of leaf curl of maize raises this reserve.

The leaf curl disease has not yet been reported on maize, at least as far as I am aware. It resembles that of the potato and like it is produced by

an invisible filtering microbe. It appeared some years ago in my experiment field following a change in the maize seed employed. Of too mixed a strain owing to being cultivated beside other varieties, the large yellow variety used was replaced by another, supposed to be a pure strain. It was some years before the disease drew my attention. The plants attacked grew slowly; in the sun the leaves developed a pronounced curl; those at the base withered progressively, starting from the tip; some plants died off, others remained sterile, those attacked the least produced seed which transmitted the disease.

Cultivated in complete aseptic solutions, the plants present the symptoms reported above while at the same time the roots are affected in their turn by peculiar deformations; the main axes often terminate hooked or spiral; their ramifications, very short, develop into small club-shaped formations. The plant as a whole has a rigid aspect and does not grow much.

Maize grown from diseased seed in a complete mineral solution rarely died off. With the development of the vegetation a progressive improvement was always observed and it was not unusual to find that many plants recovered fairly rapidly the aspect of healthy and vigorous specimens.

The recovery becomes evident and general when, after the placing of the seedlings in flasks, there is a period of very warm and sunny days. The nocturnal transudations abundant while it is always wanting in diseased or deficient plants. The roots lose their apparent rigidity and elongate very rapidly; they acquire that regular and flexible appearance which gives them, together with the long and slender ramifications, the very pleasing aspect of healthy and vigorous organs. The complete solution, therefore, acts as an environment which generates both resistance and recovery with the assistance of abundant insolation.

Smut and leaf curl disease being produced by widely differing microbial parasites, the properties of the complete mineral solution in connexion with the resistance of the plant to infectious diseases may be generalized.

Deficiency disorders.

All cultivated soils do not necessarily contain all the elements which enter into the complete nutrient solution which I established for maize. The soils which are deficient in any one of these nutrients are unsuitable for maize cultivation and probably for many other species cultivated or otherwise. The disorders due to a more or less marked deficiency in a mineral element necessary for growth must be fairly considerable.

The solution which is suitable for maize, moreover, does not allow of the normal growth of other species besides gramineous and, in particular, leguminous plants. After an apparently normal start, the leaves and shoots become etiolated. It is a question of a chlorosis due to a want of iron; maize does not suffer from this deficiency because the acid secretions of its roots, or more properly speaking of the absorptive root hairs, enable the plant to absorb iron in the presence of calcium bicarbonate which precipitates this element. If the iron is introduced into the solution in the form of citrate, lactate, tartrate, malate, etc.,

compounds which keep the iron in solution despite the bicarbonate, the chlorotic legumes recover.

The chloroses which prevail in calcareous soil reveal the same mechanism. For a long while they were attributed to an excessive absorption of limestone. Chalky soils in fact, are badly formed and do not comply with the law of physiological relations. This is a serious defect, the influence of which, however, only affects the roots indirectly. The limestone found in the plant is but a consequence of chlorosis. It accumulates in the leaves like all the other mineral elements relatively, because the roots continuing their work at reduced speed, supply the aerial parts of the plant with more mineral nutrients than they can utilize, the photosynthetic elaboration being suspended.

In a medium where the iron is rendered insoluble, the manganese and zinc and probably other elements precipitate with it; if it is iron which first or most markedly reveals the symptom of deficiency, manganese and zinc may closely follow; also when the practical side of the question is considered, a judicious solution consists in not overlooking the three possible deficiencies in the presence of a chlorosis appearing on plants growing in chalky soil.

Chlorosis of truck crops grown on sewaged land round Paris.

Iron deficiency can appear in unlooked for conditions. This is what occurred in the sewaged land of Paris. All crops suffered from chlorosis when the soil received an excessive quantity of sewage. The soil is then considered as 'burnt', only gramineous plants flourish. A more methodical application, however, makes it possible to obtain flourishing crops but not always free from chlorosis. The disease regularly appears on the same points developing according to the regular circles determined by the depressions that the naked bud is incapable of disclosing.

It seems that the disease, starting from a central point, spreads in a regular manner in every direction. Called upon to examine the situation, first of all I found that the plants carried no parasite, a finding more or less evident, a parasite does not invade all vegetables indiscriminately.

The waste waters from the Seine and the Marne are very calcareous; they are, therefore, in principle, like my complete solution, unsuitable for the normal growth of all cultivated species outside of gramineous plants. Spraying with a 1/1000 solution of perchloride of iron by the farmer concerned and at my request, to a plot of chlorotic cabbages, showed in fact that it was a case of iron deficiency.

The disorder prevails solely in the parts where the soil is depressed; evaporation is more active because the level of the waste waters is maintained for a longer period in contact with the open air; the iron oxide precipitate and particles of soil are here more heavily coated with limestone than elsewhere; only gramineous plants are capable of dissolving this limestone and absorbing the iron oxide after having made it soluble; the chlorosis which effects other species can be prevented by applications of finely divided iron sulphate before sowing

or pricking out; a more direct method consists in spraying with soluble salts of iron, manganese and zinc in the proportion of 1 gm. of each salt to 5 to 10 litres water; absorption is immediate and the result rapid.

Deficiency disorders, therefore, may prevail in the soils richest in fertilizer elements; the example of sewaged land menaced by sterilization through the waste waters with a very high calcium carbonate content, is very instructive and confirms the conclusions drawn earlier on, namely, that fertility may be defined by the degree of facility with which the soil cedes to the roots all the elements necessary to the plant.

It is imagined, however, I repeat, that a soil could be deprived of one or even several of the mineral elements indispensable to a given species. Organic and mineral fertilizers contain traces; but when it is a question of forage legumes which occupy the land for years and even more so of arboriculture, the traces of minor elements are soon exhausted and the crop gradually wastes away without any apparent reason.

It was thus that Hoagland in 1933 showed that the 'small leaf' disorder which was prevalent in the orange, citron and grapefruit orchards in California is due to a want of zinc. The application of zinc salts as mineral fertilizer and better still the spraying of dilute solutions of zinc salts on the leaves causes the radical disappearance of the disease.

Heart rot of the sugarbeet is caused by boron deficiency; it is attributed to the fungi: *Sphaerella tabifica* and *Peronospora schachtii*. This is an example of a microbial disease grafting itself onto a disorder caused by a want of boron which prepares the way for parasitic infection. Application of mineral fertilizer containing boron prevent all microbial infection.

Conclusion.

I intended to indicate the way which modern agriculture should follow by means of this brief review on the mineral nutrition of the plant and its relation with microbial resistance; a simple concept guides this way: know the requirements of the plant and establish the means of making it render all it can produce. There is nothing new in this, as the grower has never had any other ambition; until now he has been unable to attain his ambition as he only employed empiric methods; therefore, some result is already attained in discerning the path to be followed and in affirming by the few facts acquired that the plant nourished methodically, like any other living object, will faithfully recompense all the cure it is given. In this way Blackeslee demonstrated by cultivation in nutrient solutions that the tomato, *inter alia*, gives extremely high yields.

Unfortunately, these methods can only be put into practice by very experienced specialists, cultivation in liquid media can only succeed if protection is taken against microbes. If possible to bring to a successful end without observing this indispensable condition, it is by dint of precautions and supervision; all who know the difficulties to be overcome are aware that this sort of non-aseptic cultivation, even practised on a small scale, with the same apparatus

and in the same place, always end by coming up against a proliferation of noxious microbes extremely difficult to prevent and even more so to check. Numerous species of microbes in fact, develop in the complete mineral solutions wherein the roots constantly release various organic compounds and when these substances are not sufficient to maintain them, not infrequently then also attack the roots; if a harmful species turns up, the crop may be destroyed in a few days.

As is known, this is not the case in the field; the microbes, more or less fixed on the solid particles cannot follow the roots in their development; the harmful species which the roots encounter in their progress do not remain long in contact with the piliferous layer, more susceptible to microbial attack than the other parts, as it advances several centimetres par day.

It is thus considered that a nutrient solution incorporated with pure sand, realizes all the advantages of a complete aseptic solution, when it combines as such all the mineral elements indispensable to the plant.

We have seen that the sewaged land of Paris fills these conditions; the crops to day are vigorous and sound.

Other soils naturally combine the same advantages, these are the polders and granitic sands of the Brittany coast. There the plants find all the mineral elements which form the terrestrial crust; these soils are universally reputed for the quality of the seed, tubers, onions, etc. they produce.

The diseases due to invisible microbes considered until recent nears as phenomena of degeneration are, in fact, unknown for the reasons which I have amply indicated.

Permeable deep soils more or less resemble these perfect soils but differ because the elements which constitute them disequilibrate the complete solutions by rendering insoluble some of the substances contained, thus making their absorption difficult if not impossible.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Belgium. — A Decree of March 10, 1942 authorizes the capture of sparrows by means of the draw-net known as ' tirasse ' from April 15 to September 15, 1942 inclusive throughout the country. (*Moniteur belge*, Bruxelles, 22 mars 1942, n° 81, p. 1777).

France. — Ministerial Decree of May 31, 1941 institutes at the Ministry of Agriculture an Advisory Board for plant protection, commissioned with the study of questions relative to insects, cryptogamous diseases and other pests of crops, plants or their products.

The Board proposes the list of crop parasites for which control is compulsory and specifies the modalities to be carried out according to the regulations in force.

The Board is also called upon to pass an opinion on the nature of the methods of the treatments and products to be advocated for the conservation of crops. (*Journal officiel de l'Etat français*, Vichy, 4 février 1942, LXXIV^{e} année, n^{o} 30, p. 498-499).

*** Ministerial Decree of July 1, 1941 nominates the members of the aforesaid Advisory Board. (*Ibid.*, p. 499).

*** A Ministerial Decree dated December 23, 1941 specifies that for the payments of dues for phytosanitary inspection and the set registration tax regarding control of exports, the Directors of the Agricultural Services shall establish for each tax district, collection lists which will be forwarded to the prefects in charge together with the notification forms to be sent to the debtors. (*Ibid.*, 15 janvier 1942, n^{o} 13, p. 227).

*** By Ministerial Decree of December 23, 1941, the following animal and plant diseases are recognized as being dangerous to French crops:— the Colorado beetle (*Leptinotarsa decemlineata*), Japanese beetle (*Popillia japonica*), oriental fruit moth (*Laspeyresia molesta*), nun moth (*Lymantria monacha*), potato moth (*Phthorimaea operculella*), Argentine ant (*Iridomyrmex humilis*), Mediterranean fruit fly (*Ceratitis capitata*), fir tree aphis (*Dreyfusia nüsslini*), San José scale (*Aonidiella perniciosa*), mulberry scale (*Diaspis pentagona*), cottony cushion scale (*Icerya purchasi*), dodders (*Cuscuta epithymum, C. trifolii, C. epilinum, C. suaveolens*), chestnut bark disease (*Endothia parasitica*), leaf cast of Douglas fir (*Rhabdocline pseudotsugae*) and potato wart disease (*Synchytrium endobioticum*).

The control of all these parasites, from their first appearance to any stage whatsoever of their development is compulsory throughout the territory of France.

The importation of plants or parts of plants from countries where the presence of one of these parasites is reported is prohibited. However, a special authorization for importation may be granted which will specify the ports and customs offices designated for this purpose and the modalities regarding entry.

With a view to preventing all serious invasion, the Associations for the control of crop pests are commissioned from now onwards with the local organization of the control operations and the application of treatments against the aforementioned parasites. (*Ibid.*, 24 janvier 1942, n^{o} 21, p. 345).

*** By Ministerial Decree of January 30, 1942, the control of the Colorado beetle (*Leptinotarsa decemlineata*) has been made compulsory according to the modalities indicated below, throughout metropolitan France with the exception of Corsica free from this parasite.

Apart from gardens, the cultivation of potatoes is only authorized in the fields or plots designated beforehand by the mayor of the commune. The sites will be determined in such a way that the crops, for each locality, are grouped into a very small number of centres.

The lay-out of the fields proposed by the mayor will be addressed to the Director of agricultural services who, if necessary, will make any changes considered advisable.

Owing to the necessity of using insecticidal preparations, the cultivation of potatoes together with other plants, serving as food for man and animals, is prohibited.

Everyone growing potatoes is required to be on the look-out for the eventual appearance of the Colorado beetle in his crop.

As soon as anyone ascertains the presence of the Colorado beetle, he must advise the Plant Protection Association or, if this is not possible, the mayor who will inform the Director of agricultural services of the first discovery.

All potato growers must destroy the eggs, larvae and adult insects as soon as found in the field, first by careful collection, then by means of arsenical treatment.

The Plant Protection Association or, in its place, the mayor organizes control operations in the commune. To this end, gangs are formed for prospection and collection which must work at least one afternoon per week beginning from the first discovery of the Colorado beetle or, at the latest, from May 15. These gangs will be constituted with the participation of all concerned, of the unemployed and schoolchildren.

All potato fields should be examined at least once a week. The adult insects, eggs, and larvae will be carefully collected and destroyed. These inspections should be continued up to July 15 and in gardens up to harvesting.

All potato fields should be given at least two sprayings of lead arsenate, lime or alumina mixtures. Late varieties must be given three treatments throughout France and four treatments in the following departments: Aisne, Ardennes, Aube, Côte-d'Or, Doubs, Jura (occupied zone), Marne, Haute-Marne, Meuse, Meurthe-et-Moselle, Nord, Oise, Pas-de-Calais, Haute-Saône, Seine, Seine-Inférieure, Seine-et-Marne, Seine-et-Oise, Somme, Vosges, Yonne. Any heavy infestation will necessitate supplementary treatment on the part of the growers.

The dose of arsenic will vary according to the arsenic content of the products employed; it will be at least 1 kg. per hectolitre of water for diplumbic arsenic containing 11 per cent. arsenic, or 500 gm. for calcium arsenic with 25 per cent. arsenic.

Insecticidal dusts, in place of spraying, will only be authorized in certain cases determined beforehand by the Director of agricultural services.

In each commune, the mayor assisted by the president of the association for the control of crop pests, must ascertain, together with the director of agricultural services, that the necessary quantities of insecticides and sprayers required for control operations will be at the disposal of the farmers in good time and within easy reach.

In all Departements must be constituted before May 1, 1942, communal, inter-communal or cantonal associations for the permanent control of crop pests as established by Law of March 25, 1041 (Articles 2 to 7) [see this *Bulletin*, 1941, No. 10, p. 188].

Jointly with the mayor, these associations will be responsible for the local organization of control operations: prospecting, collecting, insecticidal treatments.

The Ministerial Decrees of February 18 and April 3, 1941 [see this *Bulletin*, 1941, No. 11, pp. 207-208] regulating the control of the Colorado beetle are repealed. (*Ibid.*, 8 mars 1942, nº 58, p. 960).

Italy * — A Ministerial Decree of March 14, 1942 declares compulsory in the Province of Belluno the control of the cockchafer (*Melolontha melolontha*) by means of collecting the adult insects.

⁂ A Ministerial Decree of March 31, 1942 makes compulsory in the Province of Rovigo the control of the oriental fruit moth (*Cydia molesta*) to be carried out by means of cutting and the immediate destruction of shoots which become infested, the collection and destruction of large shoots, pruning loppings, attacked fruits, the destruction of hibernal forms of the insect in warehouses (storing of the baskets in suitable premises, fumigation with sulphur and hydrocyanic acid gas) and by any other methods which will be indicated by the Royal Observatories of Phytopathology.

The Observatory at Verona will indicate the modalities to be followed in executing the control operations and will supervise their application, assisted in this task by the provincial Commissariat for plant diseases.

The horticultural and fruit-growing Section of the provincial Association of the agricultural producers of Rovigo is charged with the organization and inspection of the control operations to be carried out by and at the expense of the proprietors and usufructuaries of peach orchards in the aforesaid Province. The Section is also commissioned with the execution of control operations at the expense of infractors and those who have delayed starting.

⁂ Another Ministerial Decree of the same date declares the control of *C. molesta* compulsory in the Province of Brescia, the said control to be carried out according to the modalities established by the above-mentioned Ministerial Decree relative to the control of this insect in the Province of Rovigo.

Morocco (French Zone). — An Order of February 6, 1942 authorizes the destruction of wild boars causing serious damage in the crop lands situated in the territory of the Meknès region. (*Bulletin Officiel*, Rabat, 13 mars 1942, XXXIe année, nº 1533, p. 213-214).

⁂ With a view to controlling the pink bollworm [*Platyedra gossypiella*] and the spiny bollworm [*Earias insulana*] of the cotton plant, an Order dated February 17, 1942 lans down that all uncollected stalks, leaves, bolls, seeds and, in general, all plant trash remaining from the 1941 cotton crops, must be destroyed by burning before March 15, 1942 at the latest. (*Ibid.*, 6 mars 1942, nº 1532, p. 192).

* Communication of the Ministry of Agriculture and Forests, Rome, to the International Institute of Agriculture.

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INTERNATIONAL BULLETIN OF PLANT PROTECTION

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DISCOVERIES AND CURRENT EVENTS *

FRANCE.

Observations on the Colorado Beetle (*Leptinotarsa decemlineata*) Made in the Bordeaux Region in 1941 †

In 1940, the Colorado beetle invasion was serious and control operations much less vigorous throughout French territory. Also the numerous adult insects which had burrowed into the ground in the autumn constituted in advance a serious menace to the potato crops of 1941. The crop of that year would have been considerably affected if the weather conditions had favoured a mass appearance and the multiplication of the insects. Conditions fortunately were contrary and control operations were carried out so actively that the season ended with little loss.

The observations which I made personally in the Bordeaux region may be summed up as follows:—

The beginning of the vegetative season was characterized by a constant coolness and in particular by a cold and wet period of a month, from May 15 to June 15. The temperature rose and the weather was warm during the rest of spring and the first three weeks of summer, from June 16 to July 11; then there was a second cold and wet period much longer than the first, lasting 50 days, from July 12 to the end of August, after which the weather was fine throughout the month of September.

The hibernating Colorado beetles came out early; in the environs of Bordeaux they were easily found from the middle of April on the foliage of practically all fields, but their number subsequently did not increase, it even appeared to decrease during the first fortnight of May; scattered, showing little activity, the insects did not pair much and there was little egg-laying; most of the eggs did not hatch owing to the adverse weather.

The appearance of the spring larvae only began after June 15, three weeks later than the normal period; it occurred at the same time on all the crops of the region, but only to a small extent, with the exception of some unfavourable points.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Communication from Dr. Jean Feytaud, Director of the Laboratory of Applied Entomology, Talence, Gironde, France.

The great heat at the end of June and at the beginning of July accelerated nymphosis, and the summer imagos came up from the soil throughout the month of July, especially after the 20th.

The second generation developed during the month of August and, in the first fortnight of September, formed a larger number of adult insects; swarming was observed towards the 15th.

Thus the Bordeaux region which for some 22 years had been the centre of the Colorado beetle invasion, did not suffer much damage during the year 1941. With the exception of a few rare, more or less virulent foci, imagos and larvae were so few that repetition of insecticidal treatments was not even necessary to save the crop.

Moreover, the damage was more or less mild throughout the South West of France, though it was severe in certain parts of the North, the East and Central France. Throughout the country, the damage caused by potato blight (*Phytophthora infestans*), favoured by the rainy summer and given less treatment owing to the shortage of copper mixtures, was relatively more serious than that by the Colorado beetle.

VARIOUS QUESTIONS

Two Processes for Preserving Small Animals, Herbarium Material, Phytopathological Specimens, etc. *

I. Preservation by means of inclusion in transparent resin.

It is well known that it is not unusual to find enclosed in certain fossil resins and especially in yellow amber, diminutive insects so perfectly preserved after thousands of years that their examination and frequently also determination are still possible.

Desiring to reproduce, for scientific purposes, the method of conservation suggested by nature, it was necessary to choose a colourless and transparent material enabling the full vision on the enclosed object and a support also transparent and at the same time rigid, in such a way as to form a good solid and easily handled whole.

As regards the support, we turned to glass and, after repeated tests, we have found that the resin which is the most suitable for the purpose is dammar, already employed in microscopy, dissolved in oil of turpentine and more precisely the same solution as that utilized to protect oil-paintings.

If it is a case of an animal specimen, it is placed on a glass slab in an attitude resembling as closely as possible the habitual position or that which is

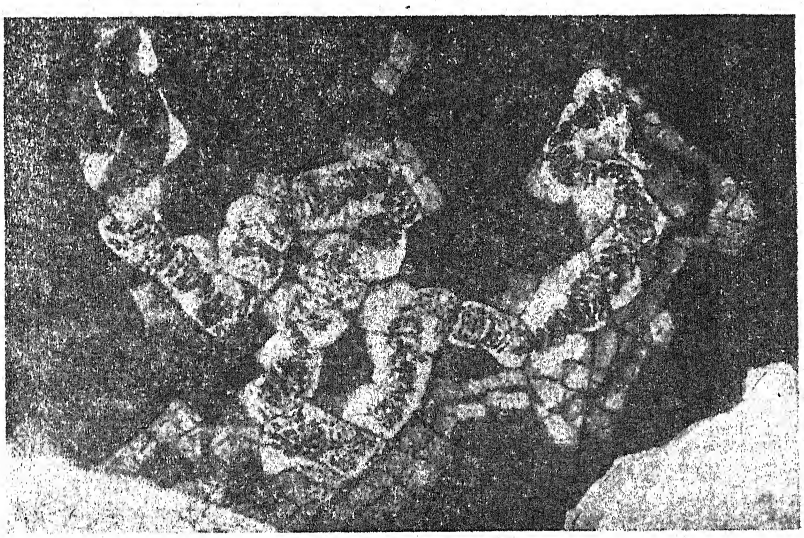
* Note from Mr. Filippo Ranzi, Rome, Italy.

the most suitable for observation; it is attached by covering it with successive layers of dammar resin and finally set aside away from dust and heat and exactly flat. The resin, which dries very slowly, itself forms a horizontal layer, with a perfectly smooth surface. When completely dried, it will form a very transparent, colourless, impermeable and resistant layer, and thus constitute an excellent protection against external agents, forming a very compact whole and easy to handle without risk of damage.

If it is a case of a plant specimen (leaf, flower, etc.) first of all it must be well flattened out and then placed on the glass after having coated the surface with resin, taking care that no air bubbles are formed. After this, successive layers of resin are applied as described above. This is particularly useful for the preservation of very small specimens, delicate and easily lost, such as pollen, spores, insect eggs, etc. After four years preservation, pollen grains encloseed in resin still appeared perfectly intact on microscopical examination.

Dammar having a refractive index differing but slightly from that of glass, the preparations may be examined with the microscope, the resin functioning as a cover-glass.

Owing to the action of the resin, the specimens very frequently become almost completely diaphanous, so that their internal structure is visible; advantage can be taken of this property to employ the preparations themselves directly as dispositives for projection, either for didactic uses, or for direct study or to obtain photographs for illustrating scientific publications, etc.



The above figure reproduces the photograph, obtained by projection, of a portion of an elm leaf with a sinuous mine made by *Nepticula centifoliella*. It is interesting to note how clearly the caterpillar living in the parenchyma of the leaf stands out, although it is not easily visible under normal conditions.

The process just described may also find a special use in the preservation of phytopathological material and also serve for constituting didactic pictures of large dimension. In this case, the resin, in a weaker solution, will be applied with the aerograph; it will also be possible, with this system, to preserve objects in some particular attitude (*e. g.*, small insects pairing), which cannot be done with the methods at present in use.

Despite the many cases where this process would be useful, the glass with its weight, volume and cost, evidently prevents it being applied to whole herbariums or to large collections or special importance, such as phytopathological collections, but, on the other hand, recourse can be had to a second process which will now be discussed.

II. Conservation by inclosure in cellophane.

Normally, the plants to be included in herbariums or in special collections are, after drying, fixed by different systems onto sheets of paper and thus conserved in packets or portefolios. As is known, this system exposes the plants to different types of damage caused by external agents (dust, humidity, corrosive gases, moulds, mites and various insects which provoke so much damage in phytological collections). Added to this is the progressive desiccation of the plant which rapidly makes it very fragile even on sole contact by those who observe it. The impossibility of conserving in their entirety the parts of plants composed of diminutive elements, very fragile and easily detachable (for example, plumose or capillary pappus); the impossibility of examining both sides of the specimens fixed on paper without detaching them from the support with subsequent danger of breaking them and loss of time.

It is also known what care and expense are required to protect these collections from destructive agents and how search is made for new systems (disinfectants, sterilizing ovens, etc.) which, however, are costly and which, in the long run, end by destroying the objects they should protect.

The process which we now describe eliminates these disadvantages with little cost and labour.

The plant to be preserved is first placed under a press (letter-book or anything similar) to flatten it as much as possible, by means of moderate pressure; it is left to desiccate for some days, taking care only to let it lose the excess moisture it would contain: it is not advisable to let it dry completely, but it is expedient, on the contrary, to work so that it still keeps all its colour and its flexibility. When flattened out, the specimen is placed on a thin sheet of cellophane, the edges are moistened with a special adhesive and the whole covered with another sheet of cellophane of the same size; in general, one sheet folded in two is used. After which and before the adhesive has time to dry (this, it should be noted, is the most important part of the process), the whole is again placed under the press. Under the action of the latter, the air contained between the two sheets is expulsed, the adhesive still being moist enables it to escape through the edges; when, always under pressure, it is completely dry, the air will no longer be able to enter nor, with it, the agents harmful to the preservation of

the specimen. Consequently, any subsequent continual and expensive use of disinfectants or annual sterilization is made unnecessary.

If a greater adherence between the plant and the cellophane sheet is desired, especially if there are main veins and other projecting parts (like galls, etc.), the plant can be coated with a weak solution of rubber in benzine which does not alter the colour and will not subsequently prevent it being removed from its envelope if necessary.

The inclosure in cellophane may be employed even in the case of extensive collections, owing to the facility with which it can be applied, the low cost of the material used and the rapidity with which the necessary operations are carried out.

The exclusion of air between the two sheets of cellophane enable the plant of part of plant to be preserved from atmospheric and pathogenic agents, avoiding continual expense and attention, as well as anxiety in regard to the conservation of rare and not easily replaceable examples.

The specimens are also protected from contact of the hands of the observer and visible on both sides.

Each preparation is very light and can be kept either directly in a porte-folio or else attached to a sheet of paper by clips so that it can be raised in order to see the under side.

The plant or part of plant, placed in its envelope of cellophane when it is not yet completely dried, conserves its flexibility and colour for a long time.

The system lends itself well to the preservation of plants or parts of plants attacked by cryptogamic diseases, the pathogenic process not undergoing any modification through the action of external causes; plants or parts of plants attacked by animal agents of little thickness and soft consistency (mites, small larvae, small butterflies, etc.). It is necessary, evidently, in this case, to take precautions in order that these small organisms may not be crushed or deformed through the action of the press; this is managed by interposing a piece of cardboard of adequate thickness and cut out at the point where the object to be included is found.

This method also makes it possible to place in the cellophane envelope, at the same time as the plant or part of plant, the relative label thus avoiding all risk of error or confusion, as well as small quantities of substances (naphthalene, camphor, etc.) suitable for preserving the specimen without having to make periodical renewals.

The specimen thus preserved can easily be extracted from the envelope when it is desired to examine it exposed and, owing to the simplicity of the process, can be replaced on completion of examination.

We may add that this same process can be applied to the conservation of that part of library collections composed of objects forming one leaf only (manuscripts, letters, maps, prints, drawings, parchments, papyrus, etc.); finally, it can also be adopted for coins of numismatic collections so as to preserve them from the action of the moisture or corrosive gases present in the atmosphere.

Application for patents has been made in the case of the two processes just described.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — By Ordinance of February 5, 1942 have again been modified the regulations relative to the size of seed potatoes, established by the Ordinance of January 10, 1939 and modified by Ordinance dated November 1, 1940 [see this *Bulletin*, 1939, No. 5, pp. 110-111 and 1941, No. 2, p. 23]. The minimum dimension is fixed at a diameter of 3 cm. for both round and oblong tubers. (*Amtliche Planzenschutzbestimmungen*, Berlin, 1. April 1942, Bd. XIV, Nr. 2, S. 59-60).

*** A Decree dated February 26, 1942 amending that of April 2, 1941 relative to the use of poisonous preparations for the control of parasites [see this *Bulletin*, 1941, No. 10, p. 186] prohibits, insofar as regards the treatment of vines, all use of arsenical preparations. (*Ibid.*, S. 58).

*** By Ministerial Provision of March 16, 1942, for the purpose of preventing the introduction of the carnation leaf curler [*Tortrix pronubana*], the importation of carnations (cut flowers) from Italy, Denmark and the Netherlands is authorized up to April 30, 1942. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang April 1942, 22. Jahrg., Nr. 4, S. 28).

Germany (Protectorate of Bohemia and Moravia). — Ministerial Notification No. 254 of February 25, 1942 modifies Notification No. 233 dated January 6, 1942 [see this *Bulletin*, 1942, No. 4, p. 56] regarding the sale of preparations for the control of plant pests.

The firms commissioned with the distribution of the preparations in question are indicated. (*Amtliche Planzenschutzbestimmungen*, Berlin, 1. April 1942, Bd. XIV, Nr. 2, S. 63).

Germany (Lorraine). — A Decree dated January 30, 1942 obliges those concerned to control mistletoe [*Viscum album*] on the trees grown along roadsides and on other ornamental trees.

The branches bearing mistletoe should be cut below the point of insertion of the parasite. They should subsequently be destroyed by fire. If more than two thirds of the tree is infested by this parasite, it is advisable to remove the entire tree. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. April 1942, Bd. XIV, Nr. 2, S. 62).

*** Another Decree of the same date relative to the control of crows, authorizes the use, during the months of March and April of the year 1942, of poison bait. (*Ibid.*, S. 63).

Germany (Prussia). — A Circular dated March 10, 1942 modifies the Circular of May 23, 1940 containing the list of grape varieties intended for use as stocks authorized for cultivation [see this *Bulletin*, 1940, No. 11, p. 214]. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang April 1942, 22. Jahrg., Nr. 4, S. 27).

Germany (Saxony). — An Ordinance of March 17, 1942 obliges the owners of sprayers to report their stocks before March 31, 1942 and to hold them at the disposal of the competent authorities who will be able, should the occasion arise, to utilize them for the community in common. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang, April 1942, 22. Jahrg., Nr. 4, S. 27-28.

Germany (Styria). — A Decree of January 22, 1942 relative to the control of the San José scale [*Aspidiotus perniciosus*] prohibits all introduction of horticultural nursery products from newly incorporated territories which before the war formed part of Yugoslavia. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. April 1942, Bd. XIV, Nr. 2, S. 60-61).

Germany (Thuringia). — By Decree of February 27, 1942, clearing of thistles is made compulsory in the circumscription of Gotha. The provi sions correspond to those adopted by Decree of October 30, 1941 [see this *Bulletin*, 1942, No. 2, p. 23] in the district of Stade. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. April 1942, Bd. XIV, Nr. 2, S. 61-62).

United States of America. — The notice of quarantine and regulations on account of the Dutch elm disease (*Ceratostomella ulmi*) have been revised on September 20, 1941 and are effective on October 1, 1941.

This revision extends the regulated area to include parts of nine Pennsylvania counties and additional sections in Connecticut, New Jersey, and New York where the disease has been located, including parts of the London County, Conn., Burlington and Ocean Counties, N. J., and the New York counties of Albany, Broome, Chenango, Delaware, Greene, Otsego, and Sullivan. The town of Huntington, Suffolk County, N. Y., has been removed from the regulated area.

The regulations prohibit the interstate movement from the regulated areas of all parts of elms of all species, except that elm lumber or products manufactured from or containing elm wood, if entirely free from bark, are exempt from restriction.

No restrictions are placed on the interstate movement wholly within the regulated area.

Shipments originating outside the regulated area may be moved through the regulated area only on through billing. Restricted articles trucked through the regulated area in summer must be covered or otherwise protected. (*Federal Register*, Washington, September 23, 1941, Vol. 6, No. 185, pp. 4834-4836).

⁂ On September 23, 1941 have been promulgated new rules and regulations for the enforcement of the Insecticide Act of 1910, to become effective on October 1, 1941. (*Ibid.*, September 25, 1941, No. 187, pp. 4878-4880).

⁂ The 6th revision dated October 2, 1941 of the gypsy moth [*Lymantria dispar*] and brown-tail moth [*Nygmia phaeorrhoea*] quarantine regulations adds to the list of articles exempted from certification requirements, box shooks,

when newly manufactured; cuttings and branches (for ornamental use) of boxwood (*Buxus sempervirens*), of California peppertree (*Schinus molle*), and of eucalyptus (*Eucalyptus globulus*); cuttings and greenhouse-grown woody plants when so labeled; and wood flour, pulverized wood, or ground wood sawdust when sifted through a screen of at least 30 meshes to the inch. (*Ibid.*, October 9, 1941, No. 197, p. 5131).

Italy. — Ministerial Circular No. 222 of February 12, 1942 advises the competent organizations to exert the strictest control in regard to the trade in anticryptogamic products, the efficacy of which is not yet recognized. (*Bollettino Ufficiale del Ministero dell'Agricoltura e delle Foreste*, Roma, 11 marzo 1942, anno XIV, n. 8, pp. 358-359).

*** Ministerial Circular No. 223 of the same date requests the competent organizations to test and try out, methodically and thoroughly, the parasiticide 'Asporital D'Amico'. (*Ibid.*, pp. 359-360).

*** A Ministerial Decree dated April 9, 1942 authorizes the hunting and capture of the wild rabbit, declared an animal pest in the territory of the Province of Cagliari. (*Gazzetta del Regno d'Italia*, Roma, 16 aprile 1942, anno 83°, n. 90, p. 1487).

*** A Ministerial Decree dated April 29, 1942 authorizes the capture of the wild boar, animal declared dangerous to cereal crops in the Provinces of Cagliari, Nuoro and Sassari. (*Ibid.*, 5 maggio 1942, n. 107, p. 1824).

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NOTES

Olive Fly: Biology and Control. — The 'Reale Accademia dei Georgofili', in collaboration with the Olive-growing Branch, organized a meeting on olive-growing studies which was held at Florence on May 15, 16 and 17, 1942.

The following resolutions, *inter alia*, were adopted:—

(1) That studies should be still more exhaustive on the biology of the olive fly (*Dacus oleae*), amply taking into account the influence of the different ecological environments, also insofar as regards the methods of controlling this insect;

(2) That new control experiments should be carried out in the various ecological environments, experiments organized with the greatest care, according to the program laid down by the Ministry of Agriculture, the interpretation of the results to entrusted to a Commission composed of entomologists and olive-growers.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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